Panasonic

TECHNICAL DATA

R410A

3WAY VRF System

U-72MF1U9
U-72MF1U9E*
U-96MF1U9
U-96MF1U9E*

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Model No.
Outdoor Unit

Class	72	96
Model Name	U-72MF1U9 U-72MF1U9E*	U-96MF1U9 U-96MF1U9E*

Refrigerant R410A is used in the outdoor units.
* Salt-Air Damage Resistant Specifications.

Indoor Units

	Class	7	9	12	15	18	19	24	36	48	54
U1	4-Way Cassette			S-12MU1U6		S-18MU1U6		S-24MU1U6	S-36MU1U6		
Y1	4-Way Cassette 60×60			S-12MY1U6		S-18MY1U6					
D1	1-Way Cassette	S-07MD1U6	S-09MD1U6	S-12MD1U6							
F1	Low Silhouette Ducted	S-07MF1U6	S-09MF1U6	S-12MF1U6	S-15MF1U6	S-18MF1U6		S-24MF1U6	S-36MF1U6	S-48MF1U6	S-54MF1U6
M1	Slim Low Static Ducted	S-07MM1U6	S-09MM1U6	S-12MM1U6	S-15MM1U6	S-18MM1U6					
E1	High Static Pressure Ducted								S-36ME1U6	S-48ME1U6	
T1	Ceiling			S-12MT1U6		S-18MT1U6		S-24MT1U6			
K1	Wall Mounted	S-07MK1U6	S-09MK1U6	S-12MK1U6		S-18MK1U6	S-19MS1U6**	S-24MK1U6			
P1	Floor Standing	S-07MP1U6	S-09MP1U6	S-12MP1U6	S-15MP1U6	S-18MP1U6		S-24MP1U6			
R1	Concealed Floor Standing	S-07MR1U6	S-09MR1U6	S-12MR1U6	S-15MR1U6	S-18MR1U6		S-24MR1U6			

** Necessary to install the External Electronic Expansion Valve Kit (Optional:CZ-P56SVK1U)

85464869258000

REFERENCE NO. TD831158-00

IMPORTANT!
Please Read Before Starting

This air conditioning system meets strict safety and operating standards. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.

WARNING This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

CAUTION This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING When Wiring

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit until all wiring and tubing are completed or reconnected and checked.
- Highly dangerous electrical voltages are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause **accidental injury or death**.
- **Ground the unit** following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.
- To prevent possible hazards from insulation failure, the unit must be grounded.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing…

Select an installation location which is rigid and strong enough to support or hold the unit, and select a location for easy maintenance.

…In a Room

Properly insulate any tubing run inside a room to prevent "sweating" that can cause dripping and water damage to walls and floors.

CAUTION Keep the fire alarm and the air outlet at least 5 feet away from the unit.

…In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

…In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

…In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Ventilate the room well, in the event that is refrigerant gas leaks during the installation. Be careful not to allow contact of the refrigerant gas with a flame as this will cause the generation of poisonous gas.
- Keep all tubing runs as short as possible.
- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

WARNING

- When performing piping work do not mix air except for specified refrigerant (R410A) in refrigeration cycle. It causes capacity down, and risk of explosion and injury due to high tension inside the refrigerant cycle.
- Refrigerant gas leakage may cause fire.
- Do not add or replace refrigerant other than specified type. It may cause product damage, burst and injury etc.

- Do not leak refrigerant while piping work for an installation or re-installation, and while repairing refrigeration parts.
  Handle liquid refrigerant carefully as it may cause frostbite.

When Servicing

- Turn the power OFF at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.

- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

WARNING

- Do not clean inside the indoor and outdoor units by users. Engage authorized dealer or specialist for cleaning.
- In case of malfunction of this appliance, do not repair by yourself. Contact to the sales dealer or service dealer for a repair.

CAUTION

- Do not touch the air inlet or the sharp aluminum fins of the outdoor unit. You may get injured.

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm after installation that no refrigerant gas is leaking. If the gas comes in contact with a burning stove, gas water heater, electric room heater or other heat source, it can cause the generation of poisonous gas.

Others

CAUTION

- Do not touch the air inlet or the sharp aluminum fins of the outdoor unit. You may get injured.

- Do not sit or step on the unit, you may fall down accidentally.

- Do not stick any object into the FAN CASE.
  You may be injured and the unit may be damaged.

Check of Density Limit

The room in which the air conditioner is to be installed requires a design that in the event of refrigerant gas leaking out, its density will not exceed a set limit.

The refrigerant (R410A), which is used in the air conditioner, is safe, without the toxicity or combustibility of ammonia, and is not restricted by laws imposed to protect the ozone layer. However, since it contains more than air, it poses the risk of suffocation if its density should rise excessively. Suffocation from leakage of refrigerant is almost non-existent.

With the recent increase in the number of high density buildings, however, the installation of multi air conditioner systems is on the increase because of the need for effective use of floor space, individual control, energy conservation by curtailing heat and carrying power, etc.

Most importantly, the multi air conditioner system is able to replenish a large amount of refrigerant compared to conventional individual air conditioners. If a single unit of the multi air conditioner system is to be installed in a small room, select a suitable model and installation procedure so that if the refrigerant accidentally leaks out, its density does not reach the limit (and in the event of an emergency, measures can be made before injury can occur).

ASHRAE and the International Mechanical Code of the ICC as well as CSA provide guidance and define safeguards related to the use of refrigerants, all of which define a Refrigerant Concentration Level (RCL) of 25 pounds per 1,000 cubic feet for R410A refrigerant. For additional guidance and precautions related to refrigerant safety, please refer to the following documents:

International Mechanical Code 2009 (IMC-2009) (or more recently revised)
ASHRAE 15
ASHRAE 34

Precautions for Installation Using New Refrigerant

1. Care regarding tubing

1-1. Process tubing

- Material: Use C1220 phosphorous deoxidized copper specified in JIS H3300 “Copper and Copper Alloy Seamless Pipes and Tubes.”
  For tubes of ø7/8" (ø22.22 mm) or larger, use C1220 T-1/2H material or H material, and do not bend the tubes.
- **Tubing size: Be sure to use the sizes indicated in the table below.**
- Use a tube cutter when cutting the tubing, and be sure to remove any flash. This also applies to distribution joints (optional).
- When bending tubing, use a bending radius that is 4 times the outer diameter of the tubing or larger.

CAUTION

Use sufficient care in handling the tubing. Seal the tubing ends with caps or tape to prevent dirt, moisture, or other foreign substances from entering. These substances can result in system malfunction.

Unit: in. (mm)

Material		O					
Copper tube	Outer diameter	1/4 (6.35)	3/8 (9.52)	1/2 (12.7)	5/8 (15.88)	3/4 (19.05)	
	Wall thickness	1/32 (0.8)	1/32 (0.8)	1/32 (0.8)	5/128 (1.0)	over 5/128 (1.0)	

Unit: in. (mm)

Material		1/2 H, H					
Copper tube	Outer diameter	7/8 (22.22)	1 (25.4)	1-1/8 (28.58)	1-1/4 (31.75)	1-1/2 (38.1)	1-5/8 (41.28)
	Wall thickness	5/128 (1.0)	5/128 (1.0)	5/128 (1.0)	3/64 (1.1)	over 3/64 (1.15)	over 3/64 (1.20)

1-2. Prevent impurities including water, dust and oxide from entering the tubing. Impurities can cause R410A refrigerant deterioration and compressor defects. Due to the features of the refrigerant and refrigerating machine oil, the prevention of water and other impurities becomes more important than ever.

2. Be sure to recharge the refrigerant only in liquid form.

2-1. Since R410A is a non-azeotrope, recharging the refrigerant in gas form can lower performance and cause defects in the unit.

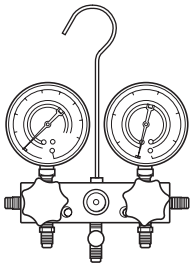
2-2. Since refrigerant composition changes and performa nce decreases when gas leaks, collect the remaining refrigerant and recharge the required total amount of new refrigerant after fixing the leak.

3. Different tools required

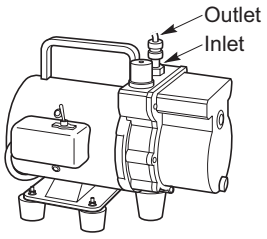
3-1. Tool specifications have been changed due to the characteristics of R410A.
Some tools for R22- and R407C-type refrigerant systems cannot be used.

Item	New tool?	R407C tools compatible with R410A?	Remarks
Manifold gauge	Yes	No	Types of refrigerant, refrigerating machine oil, and pressure gauge are different.
Charge hose	Yes	No	To resist higher pressure, material must be changed.
Vacuum pump	Yes	Yes	Use a conventional vacuum pump if it is equipped with a check valve. If it has no check valve, purchase and attach a vacuum pump adapter.
Leak detector	Yes	No	Leak detectors for CFC and HCFC that react to chlorine do not function because R410A contains no chlorine. Leak detector for HFC134a can be used for R410A.
Flaring oil	Yes	No	For systems that use R22, apply mineral oil (Suniso oil) to the flare nuts on the tubing to prevent refrigerant leakage. For machines that use R407C or R410A, apply synthetic oil (ether oil) to the flare nuts.

Manifold gauge



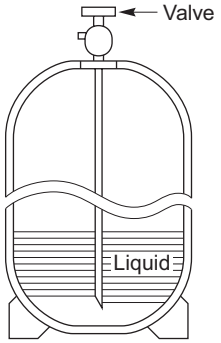
Vacuum pump



* Using tools for R22 and R407C and new tools for R410A together can cause defects.

3-2. Use R410A exclusive cylinder only.

Single-outlet valve
(with siphon tube)
Liquid refrigerant should be recharged with the cylinder standing on end as shown.



New refrigerant R410A cannot be used for earlier models

1. Compressor specifications are different.

If recharging a R22 or R407C compressor with R410A, durability will significantly decrease since some of the materials used for compressor parts are different.

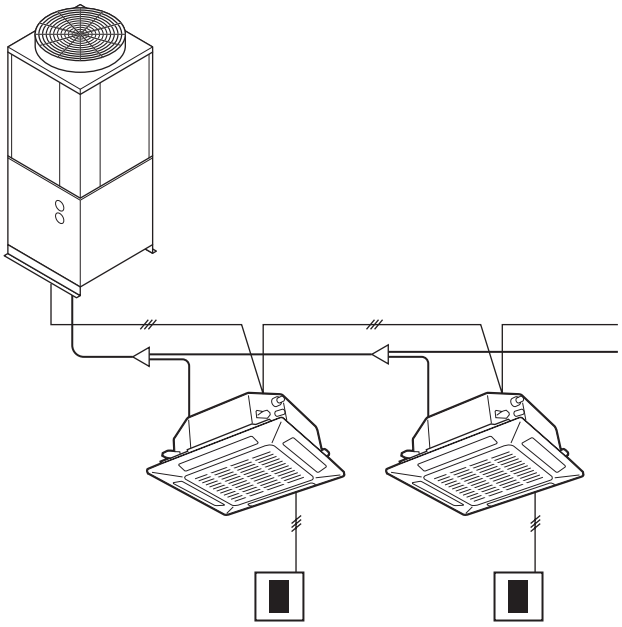
2. Existing tubing cannot be used (especially R22).

Completely cleaning out residual refrigerating machine oil is impossible, even by flushing.

3. Refrigerating machine oil differs (R22).

Since R22 refrigerating machine oil is mineral oil, it does not dissolve in R410A. Therefore, refrigerating machine oil discharged from the compressor can cause compressor damage.

R22 refrigerating machine oil	Mineral oil (Suniso oil)
R407C refrigerating machine oil	Synthetic fluid (ether oil)
R410A refrigerating machine oil	Synthetic fluid (ether oil)



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* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

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* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

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* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

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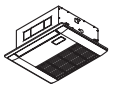
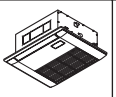
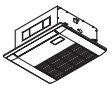
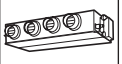
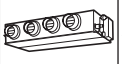
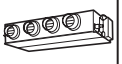
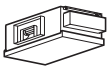
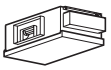
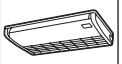
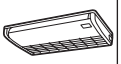
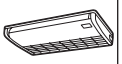
1. Line-up

Indoor units

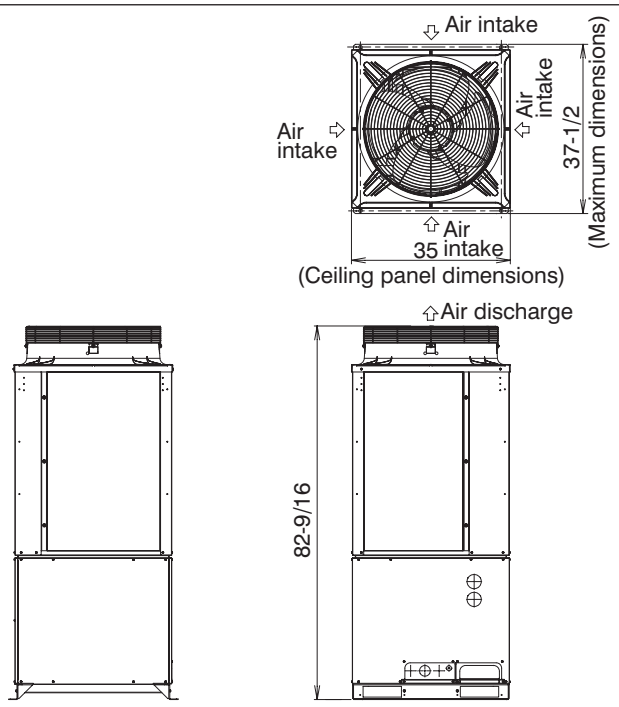
Type	7	9	12	15	18	19	24	36	48	54
4-Way Cassette (U1 Type)			S-12MU1U6		S-18MU1U6		S-24MU1U6	S-36MU1U6		
4-Way Cassette 60 X 60 (Y1 Type)			S-12MY1U6		S-18MY1U6					
1-Way Cassette (D1 Type)	 S-07MD1U6	 S-09MD1U6	 S-12MD1U6							
Low Silhouette Ducted (F1 Type)	S-07MF1U6	S-09MF1U6	S-12MF1U6	S-15MF1U6	S-18MF1U6		S-24MF1U6	 S-36MF1U6	 S-48MF1U6	 S-54MF1U6
Slim Low Static Ducted (M1 Type)	S-07MM1U6	S-09MM1U6	S-12MM1U6	S-15MM1U6	S-18MM1U6					
High Static Pressure Ducted (E1 Type)								 S-36ME1U6	 S-48ME1U6	
Ceiling (T1 Type)			 S-12MT1U6		 S-18MT1U6		 S-24MT1U6			
Wall Mounted (K1 Type)	S-07MK1U6	S-09MK1U6	S-12MK1U6		S-18MK1U6	S-19MS1U6*	S-24MK1U6			
Floor Standing (P1 Type)	S-07MP1U6	S-09MP1U6	S-12MP1U6	S-15MP1U6	S-18MP1U6		S-24MP1U6			
Concealed Floor Standing (R1 Type)	S-07MR1U6	S-09MR1U6	S-12MR1U6	S-15MR1U6	S-18MR1U6		S-24MR1U6			

* Necessary to install the External Electronic Expansion Valve Kit (Optional:CZ-P56SVK1U).

1. Line-up

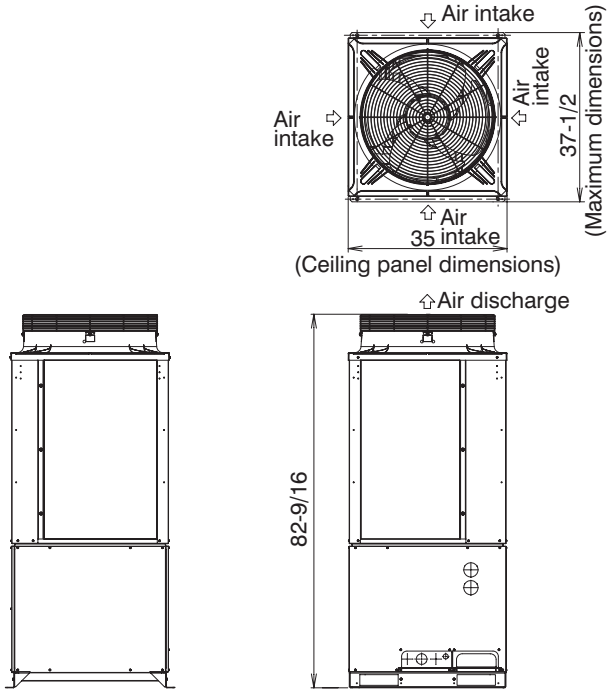
Outdoor units

Type	72
Capacity: BTU/h (kW) Cooling / Heating	72,000 (21.1) / 81,000 (23.7)
Outdoor Unit	U-72MF1U9 U-72MF1U9E*



unit : in.

Type	96
Capacity: BTU/h (kW) Cooling / Heating	96,000 (28.1) / 108,000 (31.6)
Outdoor Unit	U-96MF1U9 U-96MF1U9E*



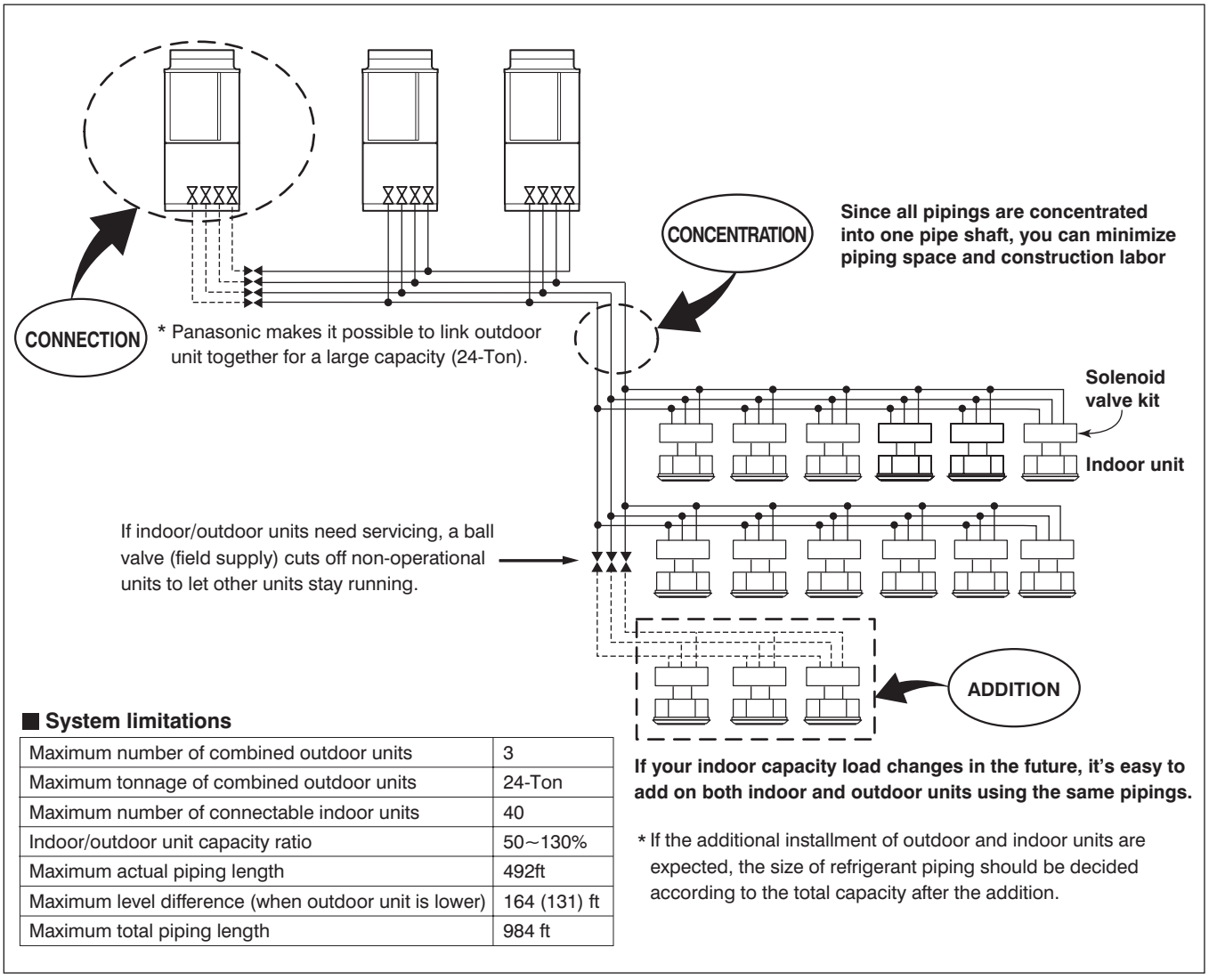
unit : in.

*Outdoor unit model name ended with letters "U9E". Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications".

2. Features of 3WAY VRF SYSTEM

2-1. Outline of 3WAY VRF SYSTEM

■ System example


CONCENTRATION
Since all pipings are concentrated into one pipe shaft, you can minimize piping space and construction labor
CONNECTION
* Panasonic makes it possible to link outdoor unit together for a large capacity (24-Ton).
Solenoid valve kit
Indoor unit
If indoor/outdoor units need servicing, a ball valve (field supply) cuts off non-operational units to let other units stay running.
ADDITION
If your indoor capacity load changes in the future, it's easy to add on both indoor and outdoor units using the same pipings.
* If the additional installment of outdoor and indoor units are expected, the size of refrigerant piping should be decided according to the total capacity after the addition.

■ System limitations

Maximum number of combined outdoor units	3
Maximum tonnage of combined outdoor units	24-Ton
Maximum number of connectable indoor units	40
Indoor/outdoor unit capacity ratio	50~130%
Maximum actual piping length	492ft
Maximum level difference (when outdoor unit is lower)	164 (131) ft
Maximum total piping length	984 ft

■ Combination of outdoor units

The DC inverter unit can be used independently or in combination.

CAUTION ● **R407C models and R22 models must not be used in combination with each other.**

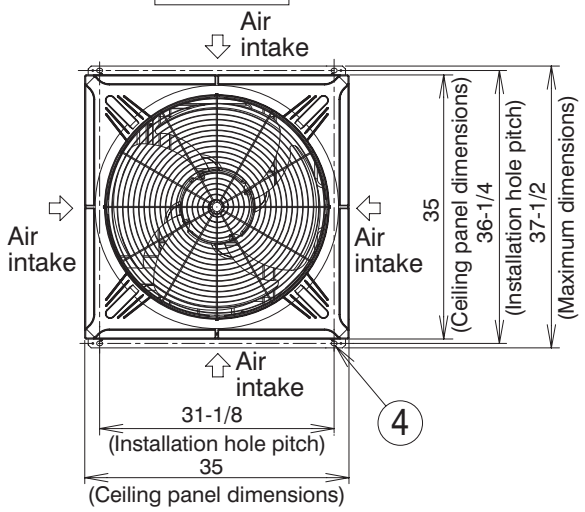
Total tonnage / Type (ton)	6	8	12	14	16	18	20	22	24
6	1		2	1		3	2	1	
8		1		1	2		1	2	3

2. Features of 3WAY VRF SYSTEM

■ Dimensions

6-Ton U-72MF1U9, U-72MF1U9E*
8-Ton U-96MF1U9, U-96MF1U9E*

6, 8 Ton

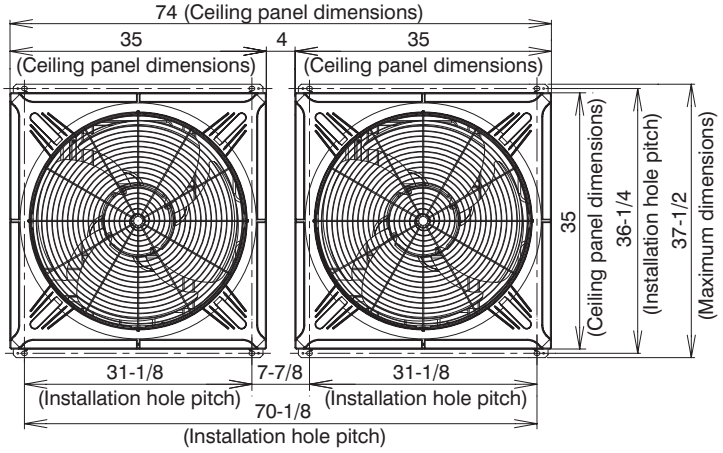


Top view

Unit: in.

■ Dimensions of unit combinations

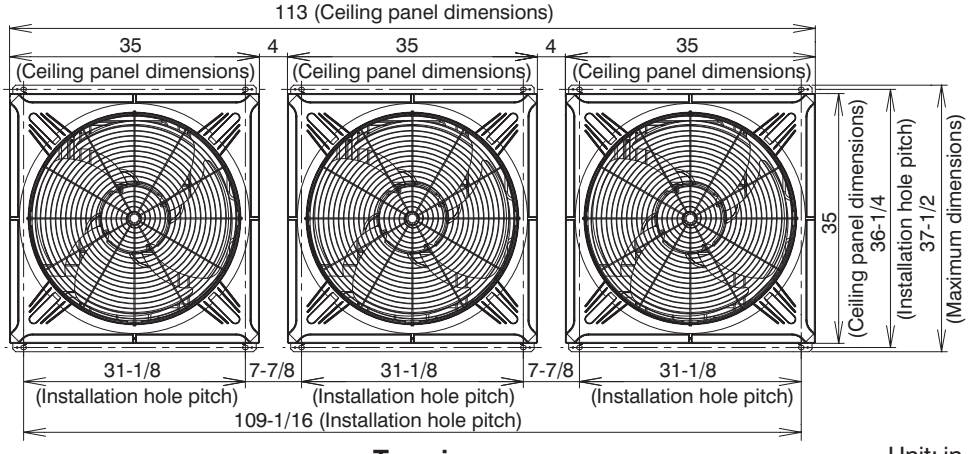
12, 14, 16 Ton



Top view

Unit: in.

18, 20, 22, 24 Ton



Top view

Unit: in.

* Outdoor unit model name ended with letters "U9E". Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications".

2. Features of 3WAY VRF SYSTEM

■ Capacity control

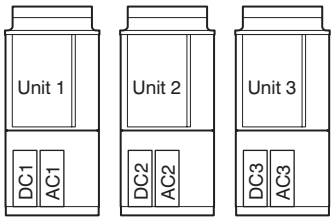
The compressor combination (DC inverter compressor + constant-speed compressor) allows smooth capacity control from 0.6-Ton to 24-Ton.

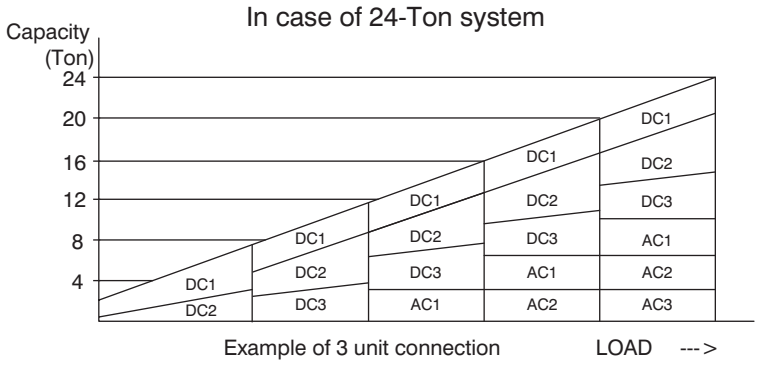
Realization of smooth capacity control from 0.6-Ton to 24-Ton

Capacity control is possible smoothly with a DC inverter compressor. The right graph shows the image of the operating combination of compressors in case of 24-Ton system. In actual operation, the combination will be changed by operating condition, operating time amount, priority of compressor and so on.

Comp. HP	Unit1(main)	Unit2(sub1)	Unit3(sub2)
DC comp.	4.0	4.0	4.0
AC comp.	5.0	5.0	5.0

*24 Ton = U-96MF1U9 (U-96MF1U9E) Type x 3





3. Salt-Air Damage Resistant Specifications

Specifications

Relevant Parts		Material	Standard Specifications	Salt-Air Damage Resistant Specifications
				Outdoor unit model name ended with letters "U9E".
Outer box/side plate/ drain pan between the stud		Hot-dip zinc-coated steel sheet	Polyester powder double coating (both sides) (≧40μm)	Polyester powder double coating (both sides) (≧120μm)
Base frame		Hot-dip aluminum-zinc coated steel sheet	No treatment	Polyester powder double coating (both sides) (≧120μm)
Fan guard		Resin (Polypropylene)	No treatment	No treatment
Heat Exchanger	Fin	Aluminum	No treatment	Zinc rich treatment
	Tube	Copper	No treatment	Zinc rich treatment (whole)
	Tube plate	Hot-dip zinc-coated steel sheet	No treatment	Zinc rich treatment (whole)
Fan	Propeller fan	Resin	No treatment	No treatment
		Aluminum	No treatment	Urethane coating (≧30μm)
		Hot-dip zinc-coated steel sheet	No treatment	Urethane coating (≧30μm)
	Motor	--	Motor maker's standard spec.	Motor maker's spec. for salt-air damage resistant (urethane coating)
	Installation frame	Hot-dip zinc-coated steel sheet	Polyester powder double coating (both sides) (≧120μm)	Polyester powder double coating (both sides) (≧120μm)
Electrical component box		Hot-dip zinc-coated steel sheet	No treatment	Polyester powder coating (≧120μm)
Tapping screws		SUS410	Hexavalent chromium-free coating	Hexavalent chromium-free coating + urethane coating
Stud supplementary bracket		Hot-dip zinc-coated steel sheet	No treatment	Polyester powder double coating (≧120μm)
PC board		--	No treatment	Dessicant coating (≧30μm)
Accumulator Receiver tank		Steel	Epoxy coating + alkyd coating	Zinc rich double coating + urethane coating (≧70μm)
Refrigeration cycle tube	Welded portion	Copper tube	No treatment	Urethane coating
	Outer surface	Copper tube	No treatment	Urethane coating
Fixing bracket		Hot-dip zinc-coated steel sheet	No treatment	Polyester powder double coating (both sides) (≧80μm)

Notes: 1 Consult us before introducing a salt-air damage resistant model as it requires a special treatment.
2 The specifications are subject to change without notice for development.
3 Contact us for the delivery schedule.

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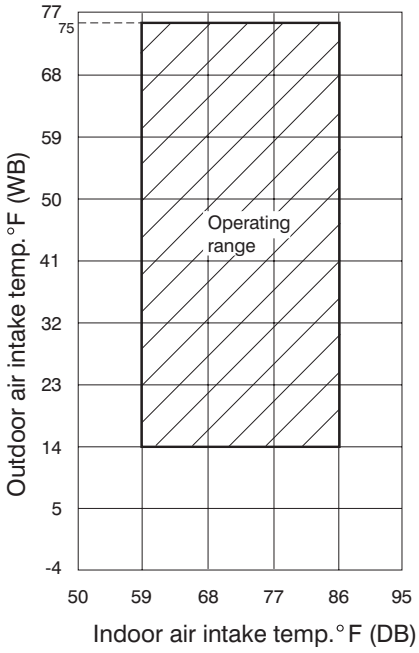
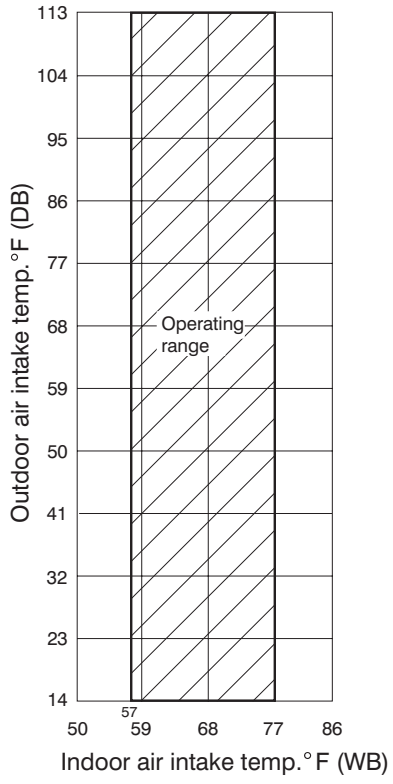
1. Model Selecting and Capacity Calculator

1-1. Operating Range

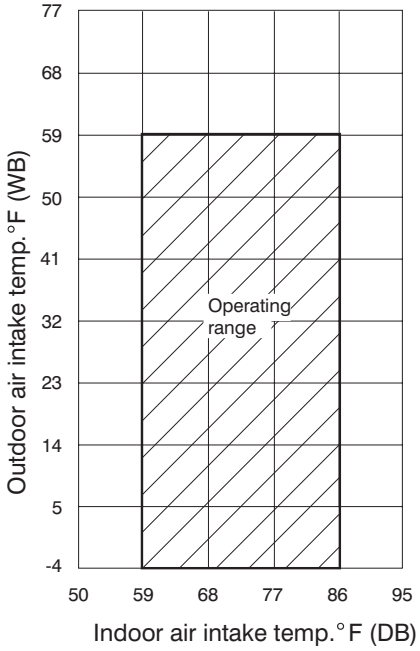
Heating and Cooling



Cooling



Heating



2

1-2. Procedure for Selecting Models and Calculating Capacity

■ Model Selection Procedure

Select the model and calculate the capacity for each refrigerant system according to the procedure shown below.

Calculation of the indoor air-conditioning load

- Calculate the maximum air-conditioning load for each room or zone.

↓

Selection of an air conditioning system

- Select the ideal air conditioning system for air conditioning of each room or zone.

↓

Design of the control system

- Design a suitable control system for the selected air conditioning system.

↓

Preliminary selection of indoor and outdoor units

- Make preliminary selections that are within the allowable range for the system ..... **2**-4 ~**2**-10

↓

Check of the tubing length and elevation difference

- Check that the length of refrigerant tubing and the elevation difference are within the allowable ranges..... **2**-4

↓

Calculation of the corrected outdoor unit capacity

- Capacity correction coefficient for model..... **2**-11
- Capacity correction coefficient for outdoor temperature conditions..... **2**-11, 13, 15
- Capacity correction coefficient for tubing length and elevation difference..... **2**-11, 14
- Heating capacity correction coefficient for frosting/defrosting..... **2**-11, 13

↓

Calculation of the corrected capacity for each indoor unit

- Capacity correction coefficient for indoor temperature conditions..... **2**-11, 14
- Capacity distribution ratio based on the tubing length and elevation difference..... **2**-11, 14

↓

Calculation of the actual capacity for each indoor unit

- Calculate the corrected indoor/outdoor capacity ratio, based on the corrected outdoor unit capacity and the total corrected capacity of all indoor units in the same system. Use the result to calculate the capacity correction coefficient for the indoor units..... **2**-11 ~**2**-15
- Multiply the corrected capacity of each indoor unit by the capacity correction coefficient to calculate the actual capacity for each indoor unit..... **2**-12

↓

Recheck of the actual capacity for each indoor unit

- If the capacity is inadequate, reexamine the unit combinations.
  Example 1: Increasing the outdoor unit capacity..... **2**-18
  Example 2: Increasing the indoor unit capacity..... **2**-19
- Increasing the tubing size..... **2**-20

↓

Design of tubing

- Create a tubing design which minimizes the amount of additional refrigerant charge as much as possible..... **2**-4 ~**2**-6
- If tubing extension for additional unit is expected in the future, create the tubing design with adequate consideration for this extension.
- Select the tubing size for the main tube (LA) up to the No. 1 distribution joint based on the rated cooling capacity of the outdoor unit. Select tubing sizes after the distribution point based on the total rated cooling capacity of the connected indoor units.
- Increasing the tubing size of the wide tubes can reduce the loss of capacity caused by longer tubing lengths. (Only the main wide tube with the largest tube diameter (main tube LA and main tubes after the distribution point that are the same size as LA) can be changed.) In this case, it is necessary to recalculate the actual indoor unit capacities..... **2**-20

↓

Calculation of additional refrigerant charge amount

- Calculate the additional refrigerant charge from the diameters and lengths of the refrigerant tubing. Even if the wide tubing diameter was increased, determine the additional refrigerant charge based only on the narrow tubing size..... **2**-21
- Check the minimum indoor capacity (limit density) with respect to the amount of refrigerant. If the limit density is exceeded, be sure to install ventilation equipment or take other corrective steps. **2**-22

↓

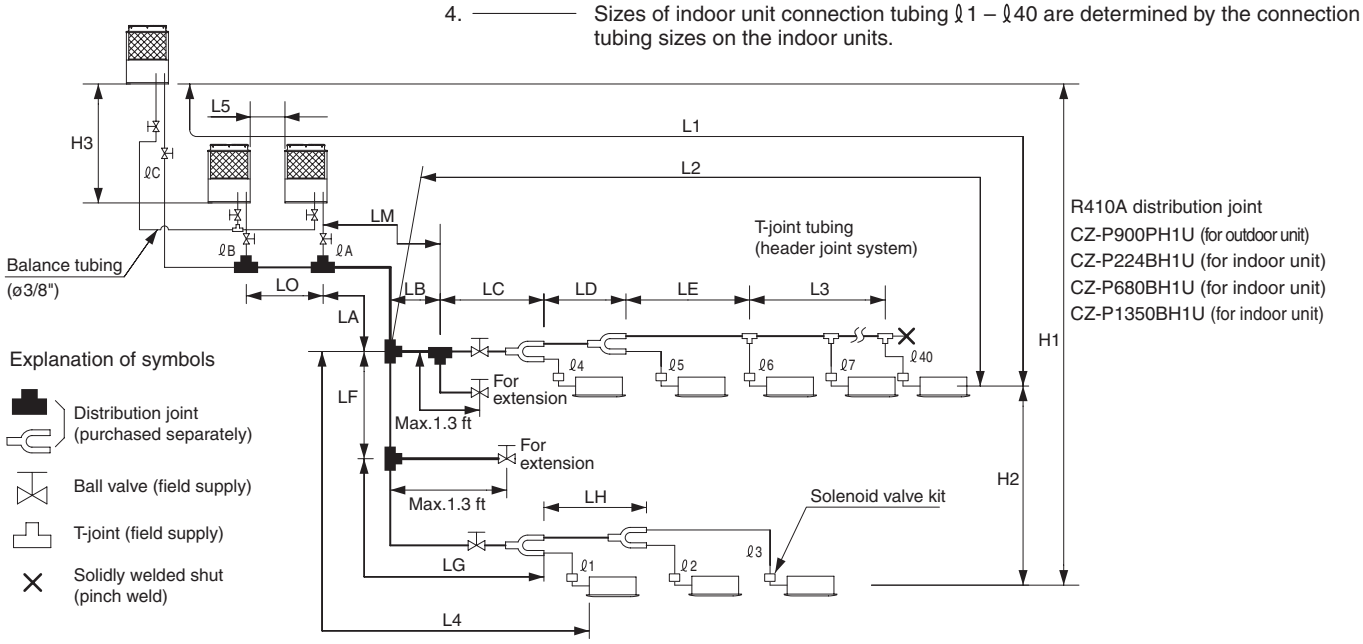
Design of electrical wiring capacity

- Select a wiring capacity according to the method of power supply..... **2**-24

1-3. Tubing Length

Select the installation location so that the length and size of refrigerant tubing are within the allowable range shown in the figure below.

1. ——— Main tubing length LM = LA + LB … ≤ 262 ft
2. ——— Main distribution tubes LC – LH are selected according to the capacity after the distribution joint.
3. The outdoor connection main tubing (LO portion) is determined by the total capacity of the outdoor units that are connected to the tube ends.
4. ——— Sizes of indoor unit connection tubing ℓ1 – ℓ40 are determined by the connection tubing sizes on the indoor units.



Note: Do not use commercially available T-joints for the liquid tubing and parts.

* Be sure to use special R410A distribution joints (CZ: purchased separately) for outdoor unit connections and tubing branches.

Table 2-1 Ranges that Apply to Refrigerant Tubing Lengths and to Differences in Installation Heights

Item	Mark	Contents		Length (ft.)
Allowable tubing length	L1	Max. tubing length	Actual length	≤ 492
			Equivalent length	≤ 574
	ΔL (L2 – L4)	Difference between max. length and min. length from the No. 1 distribution joint		≤ 131
	LM	Max. length of main tubing (at max. diameter)		≤ 262*2
	ℓ1, ℓ2...ℓ40	Max. length of each distribution tube		≤ 98
	L1+ℓ1+ℓ2...ℓ40+ ℓA+ℓB+LF+LG+LH	Total max. tubing length including length of each distribution tube (only liquid tubing)		≤ 984
	L5	Distance between outdoor units		≤ 32
Allowable elevation difference	H1	When outdoor unit is installed higher than indoor unit		≤ 164
		When outdoor unit is installed lower than indoor unit		≤ 131
	H2	Max. difference between indoor units		≤ 49
	H3	Max. difference between outdoor units		≤ 13
Allowable length of joint tubing	L3	T-joint tubing (field-supply); Max. tubing length between the first T-joint and solidly welded-shut end point		≤ 6.6

L = Length, H = Height

NOTE

1: The outdoor connection main tubing (LO portion) is determined by the total capacity of the outdoor units that are connected to the tube ends.

2: If the longest tubing length (L1) exceeds 295 ft. (equivalent length), increase the sizes of the main tubes (LM) by 1 rank for the discharge tubes, suction tubes, and narrow tubes. (field supplied)

3: If the longest main tube length (LM) exceeds 164 feet, increase the main tube size at the portion before 164 ft. by 1 rank for the suction tubes and discharge tubes. (field supplied)
(For the portion that exceeds 164 feet, set based on the main tube sizes (LA) listed in the table on the following page.)

1. Model Selecting and Capacity Calculator

Refrigerant Charge Amount at Shipment (for outdoor unit)

DC (oz)	U-72MF1U9 U-72MF1U9E	U-96MF1U9 U-96MF1U9E
	416	416

Additional Refrigerant Charge

Additional refrigerant charge amount is calculated from the liquid tubing total length as follows.

Amount of Refrigerant Charge Per ft., According to Liquid Tubing Size

Liquid tubing size (in. (mm))	Amount of refrigerant charge (oz/ft.)
ø1/4" (ø6.35)	0.279
ø3/8" (ø9.52)	0.602
ø1/2" (ø12.7)	1.38
ø5/8" (ø15.88)	1.99
ø3/4" (ø19.05)	2.78
ø7/8" (ø22.22)	3.93

Required amount of additional refrigerant charge = [(Amount of additional refrigerant charge per ft. of each size of liquid tube × its tube length) + (...) + (...)] + [Necessary amount of additional refrigerant charge per outdoor unit + (...) + (...)]

* Always charge accurately using a scale for weighing.

Table 2-1-1 Necessary Amount of Refrigerant Charge Per Outdoor Unit

U-72MF1U9 U-72MF1U9E	U-96MF1U9 U-96MF1U9E
42 oz/unit	42 oz/unit

System Limitations

Max. No. allowable connected outdoor units	3 *1
Max. capacity allowable connected outdoor units	288,000 BTU/h (24-Ton, 84 kW)
Max. connectable indoor units	40
Max. allowable indoor/outdoor capacity ratio	50 – 130 %

*1: Up to 3 units can be connected if the system has been extended.

1-4. Tubing Size

Table 2-2 Main Tubing Size (LA)

Unit: in. (mm)

BTU/h (kW)	72,000 (21.1)	96,000 (28.1)	139,000 (40.7)	168,000 (49.2)	192,000 (56.3)	203,000 (59.5)	240,000 (70.3)	264,000 (77.4)	288,000 (84.4)
Total system tonnage	6	8	12	14	16	18	20	22	24
Combined outdoor models	U-72MF1U9(E)	U-96MF1U9(E)	U-72MF1U9(E) U-72MF1U9(E)	U-96MF1U9(E) U-72MF1U9(E)	U-96MF1U9(E) U-96MF1U9(E)	U-72MF1U9(E) U-72MF1U9(E) U-72MF1U9(E)	U-96MF1U9(E) U-72MF1U9(E) U-72MF1U9(E)	U-96MF1U9(E) U-96MF1U9(E) U-72MF1U9(E)	U-96MF1U9(E) U-96MF1U9(E) U-96MF1U9(E)
Suction tubing	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)				ø1-3/8" (ø34.92)		
Discharge tubing	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)			ø1-1/8" (ø28.58)			
Liquid tubing	ø3/8" (ø9.52)		ø1/2" (ø12.7)	ø5/8" (ø15.88)			ø3/4" (ø19.05)		

*1: If future extension is planned, select the tubing diameter based on the total tonnage after extension. However extension is not possible if the resulting tubing size is two ranks higher.
*2: The balance tube (outdoor unit tube) diameter is ø3/8" (ø9.52).
*3: Type 1 tubing should be used for the refrigerant tubes.
*4: If the length of the longest tube (L1) exceeds 295 ft. (equivalent length), increase the main tube (LM) size by 1 rank for the suction, discharge, and liquid tubes. (Use field-supply reducers.) (Select from Table 2-2 and Table 2-7.)
*5: If the longest main tube length (LM) exceeds 164 ft., increase the main tube size at the portion before 164 ft. by 1 rank for the suction tubes and discharge tubes.
(For the portion that exceeds 164 ft., set based on the main tube sizes (LA) listed in the table above.)

2

■ Size of tubing (LO) between outdoor units

Select the size of tubing between outdoor units based on the main tubing size (LA) as given in the table above.

Table 2-3 Main Tubing Size After Distribution (LB, LC...)

Unit: in. (mm)

Total capacity after distribution	Below BTU/h	24.200	54.600	85.300	102.400	124.200	143.300	162.400	200.600	238.900
	Over BTU/h	–	24.200	54.600	85.300	102.400	124.200	143.300	162.400	200.600
Tubing size	Suction tubing	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)	ø1-1/8" (ø28.58)	ø1-1/8" (ø28.58)	ø1-1/8" (ø28.58)	ø1-1/8" (ø28.58)
	Discharge tubing	ø1/2" (ø12.70)	ø5/8" (ø15.88)	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø7/8" (ø22.22)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)
	Liquid tubing	ø3/8" (ø9.52)	ø3/8" (ø9.52)	ø3/8" (ø9.52)	ø3/8" (ø9.52)	ø1/2" (ø12.70)	ø1/2" (ø12.70)	ø1/2" (ø12.70)	ø5/8" (ø15.88)	ø5/8" (ø15.88)

Total capacity after distribution	Below BTU/h	258.000	334.400	–
	Over BTU/h	238.900	258.000	334.400
Tubing size	Suction tubing	ø1-3/8" (ø34.92)	ø1-3/8" (ø34.92)	ø1-1/2" (ø41.28)
	Discharge tubing	ø1-1/8" (ø28.58)	ø1-1/8" (ø28.58)	ø1-1/8" (ø28.58)
	Liquid tubing	ø3/4" (ø19.05)	ø3/4" (ø19.05)	ø3/4" (ø19.05)

*1: The outdoor unit connection tubing (LO) is determined by the total capacity of the outdoor units connected to the tube ends. The tubing size is selected based on the table of main tube sizes after the branch.

*2: If the total capacity of the indoor units connected to the tube ends is different from the total capacity of the outdoor units, then the main tube size is selected based on the total capacity of the outdoor units.
(For LA, LB, and LF in particular)

Table 2-4 Outdoor Unit Tubing Connection Size (ℓA – Dℓ)

BTU/h (kW)	72,000 (21.1)	96,000 (28.1)
Suction tubing	ø3/4"*1 (ø19.05)*1	ø7/8"*2 (ø22.22)*2
	Brazing connection	
Discharge tubing	ø5/8" (ø15.88)	ø3/4" (ø19.05)
	Brazing connection	
Liquid tubing	ø3/8" (ø9.52)	ø3/8" (ø9.52)
	Flare connection	
Balance tubing	ø3/8" (ø9.52)	
	Flare connection	

Unit: in. (mm)

*1 If the size of tubing (LA) is less than 16.4 feet, it is recommended that the tubing diameter be larger than ø7/8" (ø22.22).

*2 If the size of tubing (LA) is less than 16.4 feet, it is recommended that the tubing diameter be larger than ø1-1/8" (ø28.58).

Table 2-5 Amount of Refrigerant Charge

Liquid tubing size (in. (mm))	Amount of refrigerant charge (oz/ft.)
ø1/4" (ø6.35)	0.279
ø3/8" (ø9.52)	0.602
ø1/2" (ø12.7)	1.38
ø5/8" (ø15.88)	1.99
ø3/4" (ø19.05)	2.78
ø7/8" (ø22.22)	3.93

Table 2-6 Indoor Unit Tubing Connection Size (1– 40)

Unit: in. (mm)

Indoor unit type		7	9	12	15	18	19	24	36	48	54
Distribution joint-solenoid valve kit tubing	Suction tubing	ø5/8" (ø15.88)									
	Discharge tubing	ø1/2" (ø12.7)									
	Liquid tubing	ø3/8" (ø9.52)									
Solenoid valve kit-Indoor unit tubing connection	Gas tubing	ø1/2" (ø12.7)						ø5/8" (ø15.88)			
	Liquid tubing	ø1/4" (ø6.35)						ø3/8" (ø9.52)			

*1: For the solenoid valve kits, use type 160 with parallel specifications. Branch the tubing before and after the solenoid valve kits.

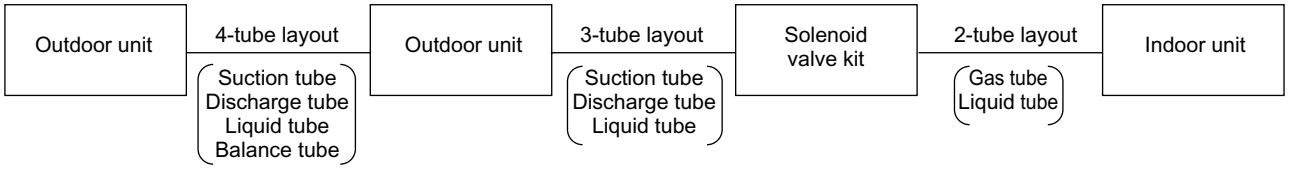
Table 2-7 Refrigerant tubing (Existing tubing can be used.)

Tubing size (in. (mm))			
Material O		Material 1/2H • H	
ø1/4" (ø6.35)	t1/32 (t0.8)		
ø3/8" (ø9.52)	t1/32 (t0.8)	ø1-1/8" (ø28.58)	t5/128 (t1.0)
ø1/2" (ø12.7)	t1/32 (t0.8)	ø1-1/4" (ø31.75)	t3/64 (t1.1)
ø5/8" (ø15.88)	t5/128 (t1.0)	ø1-1/2" (ø38.10)	over t3/64 (t1.15)
ø3/4" (ø19.05)	over t5/128 (t1.0)	ø1-5/8" (ø41.28)	over t3/64 (t1.20)
ø7/8" (ø22.22)	t5/128 (t1.0)		

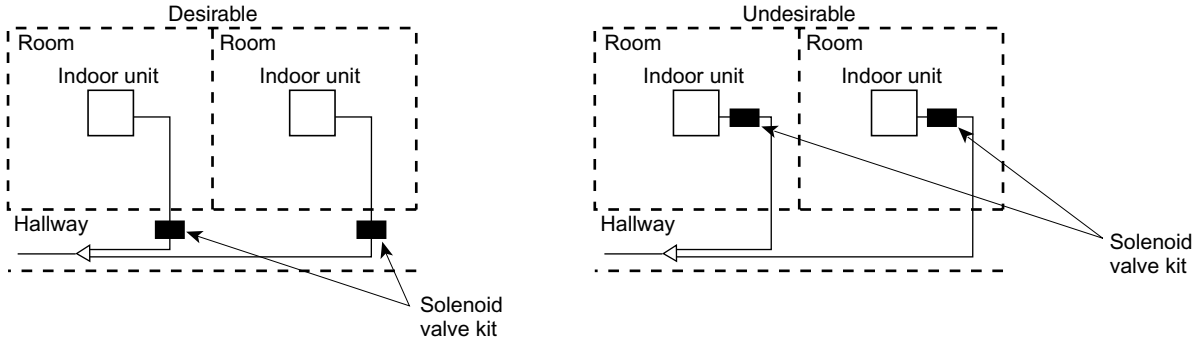
* When bending the tubes, use a bending radius that is at least 4 times the outer diameter of the tubes.
In addition, take sufficient care to avoid crushing or damaging the tubes when bending them.

1-5. Installation Standards

Relationship between A/C units and refrigerant tubing



- Install the solenoid valve kit 98 ft. or less from the indoor unit.
- In quiet locations such as hospitals, libraries, and hotel rooms, the refrigerant noise may be somewhat noticeable. It is recommended that the solenoid valve kit be installed inside the corridor ceiling, at a location outside the room.



Common solenoid valve kit

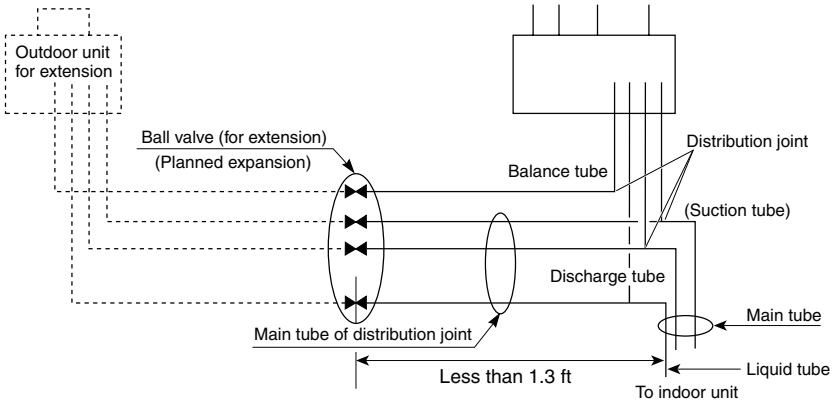
- Multiple indoor units under group control can utilize a solenoid valve kit in common.
- Categories of connected indoor unit capacities are determined by the solenoid valve kit.

Type of solenoid valve kit	Total capacity of indoor units (BTU/h)
160	19.000 < Total capacity ≤ 54.600
56	7.500 ≤ Total capacity ≤ 19.000

- If the capacity range is exceeded, use 2 solenoid valves connected in parallel.

(2) When adding ball valve for outdoor unit

1. Location: Install the ball valve at the main tube of the distribution joint.



2. Installation requirements

- Be sure to install the ball valve up-grade to prevent the inadvertent flow of oil.
- Install the ball valve at the shortest distance (within 1.3 ft.) from the main tube. If the diameter of the ball valve is smaller than that of the main tube, use a reducer or the like to reduce the size of the tubing at that location.

NOTE

- If the ball valve is installed at the outdoor unit (including extension for outdoor unit), face the service port of the valve toward the outdoor unit side (see above illustration; dotted line) and allow a distance of over 1.6 ft from the outdoor unit. If the ball valve is installed between the indoor unit (including extension for indoor unit) and the main tube, face the ball valve toward the indoor unit side (see above illustration; dotted line).
- Use a field supply ball valve.

1-6. Straight Equivalent Length of Joints

Design the tubing system by referring to the following table for the straight equivalent length of joints.

Table 2-8 Straight Equivalent Length of Joints

Unit: ft.

Gas tubing size (in.(mm))	**1/2" (12.7)**	**5/8" (15.88)**	**3/4" (19.05)**	**7/8" (22.22)**	**1" (25.4)**	**1-1/8" (28.58)**	**1-3/8" (38.1)**
90° elbow	1	1.1	1.4	1.6	1.7	1.9	2.5
45° elbow	0.8	0.9	1	1.2	1.3	1.4	1.8
U-shape tube bent (R2–23/64–3–15/16 in.)	3	3.4	4.1	4.7	5.1	5.6	7.4
Trap bend	7.5	9.2	10.5	12.5	14.1	15.4	19.2
Y-branch distribution joint	Equivalent length conversion not needed.						
Ball valve for service	Equivalent length conversion not needed.						

■ **Check of limit density**

WARNING **Always check the gas density limit for the room in which the unit is installed.**

1-7. Check of limit density

When installing an air conditioner in a room, it is necessary to ensure that if the refrigerant gas accidentally leaks out, its density does not exceed the limit level for that room.

CAUTION **Pay special attention to any location, such as a basement, etc., where leaking refrigerant can accumulate, since refrigerant gas is heavier than air.**

1-8. Calculation of Actual Capacity of Indoor Unit

■ Calculating the actual capacity of each indoor unit

Because the capacity of a multi air-conditioner changes according to the temperature conditions, tubing length, elevation difference and other factors, select the correct model after taking into account the various correction values. When selecting The model, calculate the corrected capacities of the outdoor unit and each indoor unit. Use the corrected outdoor unit capacity and the total corrected capacity of all the indoor units to calculate the actual final capacity of each indoor unit.

1. Outdoor unit capacity correction coefficient

Find the outdoor unit capacity correction coefficient for the following items.

(1) Capacity correction for the outdoor unit model
The capacity correction coefficient is 1.00.

(2) Capacity correction for the outdoor unit temperature conditions
Cooling: From the graph of capacity characteristics on page **2**-13 (■ Graph of Outdoor Unit Capacity Characteristics), use the outdoor temperature to find the capacity correction coefficient.
Heating: From the graph of capacity characteristics on page 2-15, use the outdoor temperature to find the capacity correction coefficient.
* Indoor air intake temperature should be set to 68 °FDB.

(3) Capacity correction for the outdoor unit tubing length and elevation difference
From the graph of capacity change characteristics on page 2-14, use the tubing length and elevation difference to find the capacity correction coefficient.
The outdoor unit correction coefficient is the value which corresponds to the most demanding indoor unit.

(4) Capacity correction for outdoor unit frosting/defrosting during heating
From the table on page **2**-13, find the capacity correction coefficient.

2. Indoor unit capacity correction coefficients

Find the indoor unit capacity correction coefficient for the following items.

(2) Capacity correction for the indoor unit temperature conditions
From the graph of capacity characteristics on page 2-14 (■ Graph of Indoor Unit Capacity Characteristics), use the indoor temperature to find the capacity correction coefficient.

(3) Capacity distribution ratio based on the indoor unit tubing length and elevation difference
First, in the same way as for the outdoor unit, use the tubing length and elevation difference for each indoor unit to find the correction coefficient from the graph of capacity change characteristics on page **2**-14. Then divide the result by the outdoor unit correction coefficient to find the capacity distribution ratio for each indoor unit.

Capacity distribution ratio for each indoor unit (3) = Correction coefficient for that indoor unit / Correction coefficient for the outdoor unit

3. Calculating the corrected capacities for the outdoor unit and each indoor unit

The corrected capacities for the outdoor unit and each indoor unit are calculated form the formula below.

<Cooling>

- Outdoor unit corrected cooling capacity (5) = Outdoor unit rated cooling capacity × Correction coefficient for model ((1) Page **2**-11) × Correction coefficient for outdoor temperature conditions ((2) Page **2**-13) × Correction coefficient for tubing length and elevation difference ((3) Page **2**-14)

  * However, if the outdoor unit corrected cooling capacity [5] is greater than 100%, then the outdoor unit corrected cooling capacity [5] is considered to be 100%.

- Corrected cooling capacity of each indoor unit (5) = Rated cooling capacity for that indoor unit × Correction coefficient for indoor temperature conditions at that indoor unit ((2) Page **2**-14) × Distribution ratio based on tubing length and elevation difference at that indoor unit ((3) Page **2**-14)

However, the corrected cooling capacity of each indoor unit is found as shown below.
If (2) < 100% and (2) × (3) > 100%: Corrected cooling capacity for that indoor unit [5] = Rated cooling capacity for that indoor unit
If (2) ≥100%: Corrected cooling capacity for that indoor unit (5) = Rated cooling capacity for that indoor unit × (2)

<Heating>

- Outdoor unit corrected heating capacity (5) = Outdoor unit rated heating capacity × Correction coefficient for model ((1) Page **2**-11) × Correction coefficient for outdoor temperature conditions ((2) Page **2**-15) × Correction coefficient for tubing length and elevation difference ((3) Page **2**-14) × Correction coefficient for frosting/defrosting ((4) Page **2**-13)

* However, if the outdoor unit corrected heating capacity [5] is greater than 100%, then the outdoor unit corrected heating capacity is considered to be 100%.

- Corrected heating capacity of each indoor unit (5) = Rated heating capacity for that indoor unit × Correction coefficient for indoor temperature conditions at that indoor unit ((2) Page **2**-14) × Distribution ratio based on tubing length and elevation difference at that indoor unit.

However, the corrected heating capacity of each indoor unit is found as shown below.
If (2) < 100% and (2) × (3) > 100%: Corrected heating capacity for that indoor unit (5) = Rated heating capacity for that indoor unit
If (2) ≥ 100%: Corrected heating capacity for that indoor unit (5) = Rated heating capacity for that indoor unit × (2)

* Characteristic graphs are shown on the pages listed above next to each correction item. Find each correction coefficient from the appropriate conditions.

4. Calculating the actual indoor unit capacity based on the indoor/outdoor corrected capacity ratio

Calculate the actual capacity of each indoor unit from the values (found in (3)) for the corrected outdoor unit capacity and the corrected capacity of each indoor unit.

<Cooling capacity>

Corrected indoor/outdoor capacity ratio during cooling (Ruc) = Total corrected cooling capacity of all indoor units in that system / Corrected outdoor unit cooling capacity

If the corrected outdoor unit cooling capacity is greater than or equal to the total corrected unit cooling capacity of all indoor units in that system (Ruc ≤ 1), then:

Actual cooling capacity of each indoor unit (7) = Corrected cooling capacity of each indoor unit (5) (In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is 1.)

If the corrected outdoor unit cooling capacity is less than the total corrected unit cooling capacity of all indoor units in that system (Ruc > 1), then:

(Actual cooling capacity of each indoor unit (7)) = (Corrected cooling capacity of each indoor unit (5)) × $\underline{(0.25 \times Ruc + 0.75) / Ruc}$

(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is the underlined part in the formula above.)

<Heating capacity>

Corrected indoor/outdoor capacity ratio during heating (Ruh) = Total corrected heating capacity of all indoor units in that system / Corrected outdoor unit heating capacity

If the corrected outdoor unit heating capacity is greater than or equal to the total corrected unit heating capacity of all indoor units in that system (Ruh ≤ 1), then:

Actual heating capacity of each indoor unit (7) = Corrected heating capacity of each indoor unit (5)

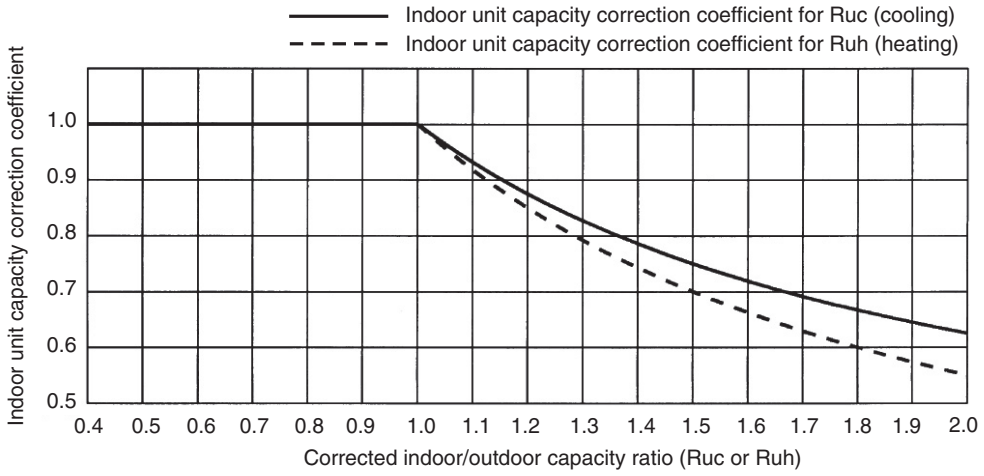
(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is 1.)

If the corrected outdoor unit heating capacity is less than the total corrected unit heating capacity of all indoor units in that system (Ruh > 1), then:

(Actual heating capacity of each indoor unit (7)) = (Corrected heating capacity of each indoor unit (5)) × $\underline{(0.1 \times Ruh + 0.9) / Ruh}$

(In other words, the correction coefficient (6), based on the corrected indoor/outdoor capacity ratios for each indoor unit, is the underlined part in the formula above.)

Refer to the graph below for the correction coefficients for Ruc and Ruh.


Indoor unit capacity correction coefficient for Ruc (cooling)
Indoor unit capacity correction coefficient for Ruh (heating)
Indoor unit capacity correction coefficient
1.0
0.9
0.8
0.7
0.6
0.5
0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
Corrected indoor/outdoor capacity ratio (Ruc or Ruh)

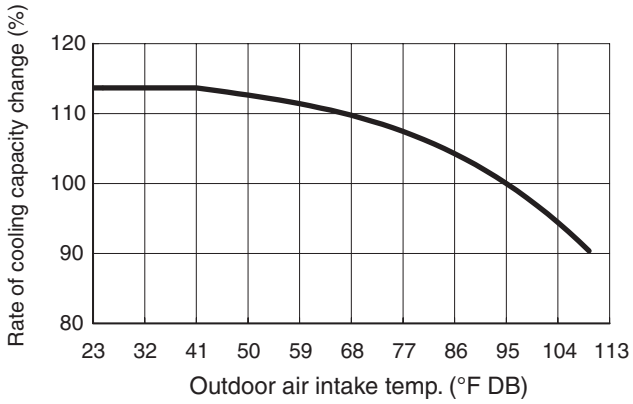
NOTE

When Ruc or Ruh is less than or equal to 1.0, the indoor unit capacity correction coefficient for both Ruc and Ruh is 1.0.

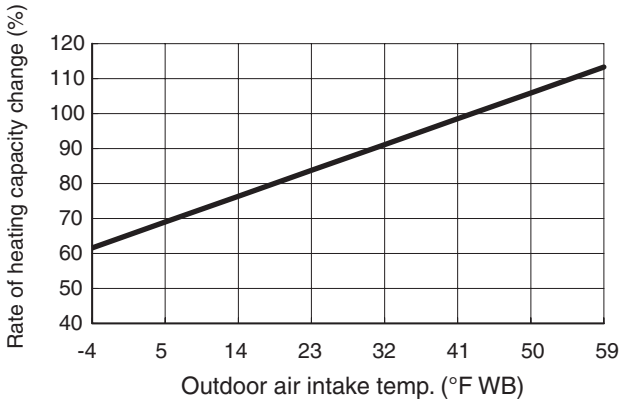
5. Graph of capacity correction coefficients

■ Graph of outdoor unit capacity characteristics (1 – (2))

Outdoor unit cooling capacity characteristics



Outdoor unit heating capacity characteristics



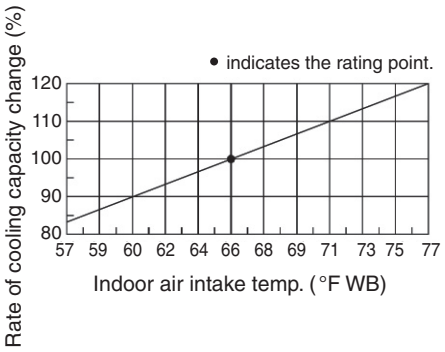
■ Outdoor unit heating capacity correction coefficient during frosting/defrosting (1 – (4))

Outdoor intake air temp. (°FWB RH85%)	–4	5	14	17	21	23	24	28	30	32	33	35	37	39	41	42
Correction coefficient	0.97	0.97	0.97	0.96	0.94	0.91	0.89	0.87	0.87	0.87	0.88	0.89	0.91	0.92	0.95	1.0

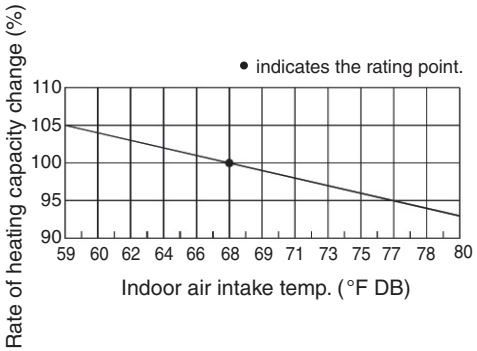
* To calculate the heating capacity with consideration for frosting/defrosting operation, multiply the heating capacity found from the capacity graph by the correction coefficient from the table above.

■ Graph of indoor unit capacity characteristics (2 – (2))

Indoor unit cooling capacity characteristics

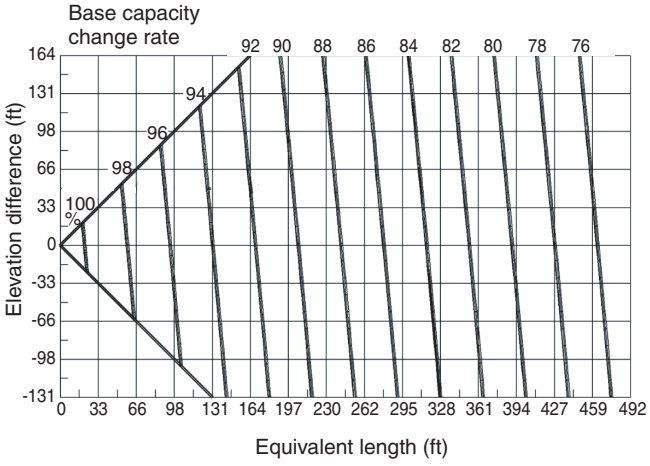


Indoor unit heating capacity characteristics

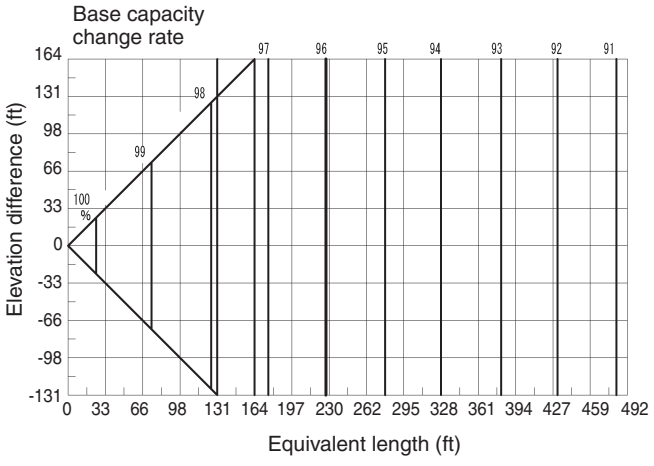


■ Graph of capacity change characteristics resulting from tubing length and elevation difference (1 / 2 – (3))

<Cooling>



<Heating>



The positive side for the elevation difference indicates that the outdoor unit is installed at a higher position than the indoor units. The negative side indicates the opposite.

- The capacity loss that is caused by the tubing length can be reduced by increasing the sizes of the discharge tubes and suction tubes. Refer to Table 2-9 and make the appropriate changes. However be sure that the total length does not exceed the maximum.
  * The only sizes which can be increased are the LM (main tube with the largest diameter) gas tubes, and the changes are limited to those shown in Table 2-9.
    In addition, note that the additional refrigerant charge is determined only by the narrow-tube size.

Table 2-9 Equivalent Length Correction Coefficient when the Size of the Discharge Tubes and Suction Tubes (LM) is Increased

Standard tubing diameter (gas tube, in.(mm))	ø1/2" (ø12.7)	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)
Tubing diameter after change (gas tube,in.(mm))	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)	ø1-3/8" (ø34.92)
Equivalent length correction coefficient	0.4		0.5		0.6

* If the size of the discharge tubes and suction tubes (LM) have been increased, apply the correction coefficient from Table 2-9 and calculate the equivalent length of the LM section.

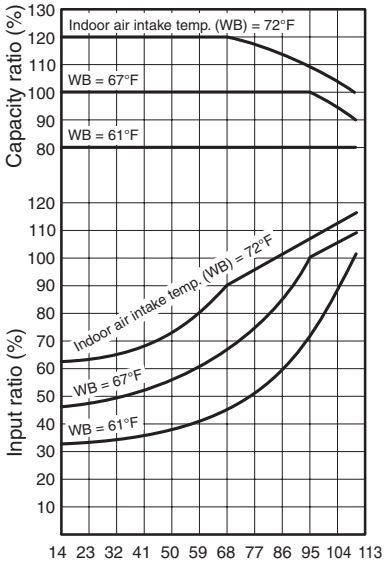
Equivalent length of tubing after size increase = Standard tubing equivalent length × Equivalent length correction coefficient

1-9. Capacity Correction Graph According to Temperature Condition

■ Capacity characteristics

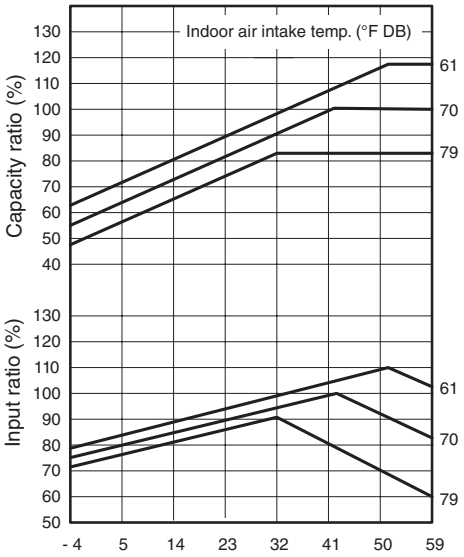
(The corrected capacity for specific temperature conditions can be found from the graphs below.)

< Cooling >

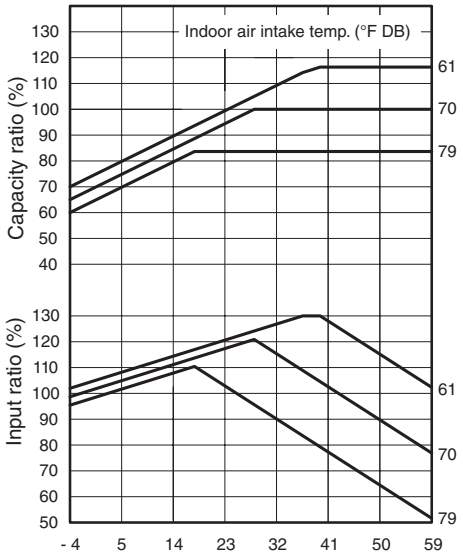

Capacity ratio (%)
Input ratio (%)
Indoor air intake temp. (WB) = 72°F
WB = 67°F
WB = 61°F
Indoor air intake temp. (WB) = 72°F
WB = 67°F
WB = 61°F
14 23 32 41 50 59 68 77 86 95 104 113

< Heating >

■ 6-Ton



■ 8-Ton



● **Heating capacity correction coefficients for frost/defrost operation**

Outdoor intake air temp. (°F WB RH85%)	−4	5	14	17	21	23	24	28	30	32	33	35	37	39	41	42
Correction coefficient	0.97	0.97	0.97	0.96	0.94	0.91	0.89	0.87	0.87	0.87	0.88	0.89	0.91	0.92	0.95	1.0

* The heating capacity when frost/defrost operation is considered is calculated by multiplying the heating capacity found from the capacity graph by the correction coefficient from the table above.

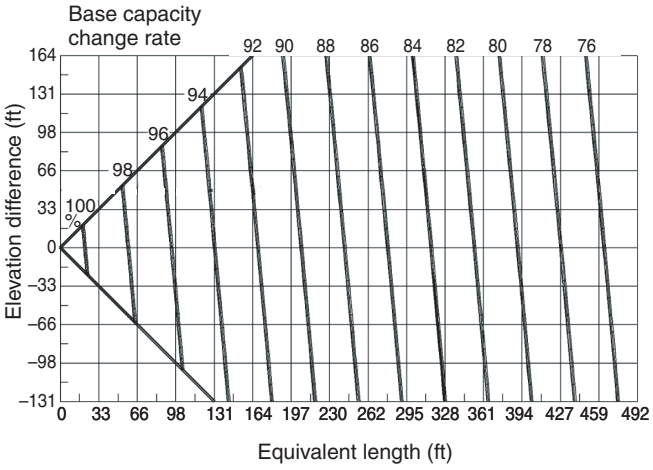
- **Rated performance values**

Item / Type	Cooling		Heating	
	Cooling capacity BTU/h(kW)	Power consumption kW	Heating capacity BTU/h(kW)	Power consumption kW
72	72,000(21.1)	5.30	81,000(23.7)	5.79
96	96,000(28.1)	7.75	108,000(31.6)	8.6

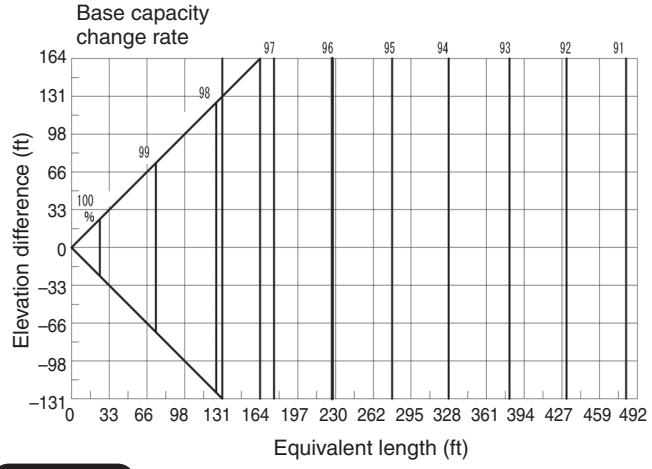
1-10. Capacity Correction Graph According to Tubing Length and Elevation Difference

■ Capacity change characteristics

<Cooling>



<Heating>



NOTE

The positive side for the elevation difference indicates that the outdoor unit is installed at a higher position than the indoor units. The negative side indicates the opposite.

*1 Sample calculations
(System: 8 Ton, 164ft equivalent length, 49ft elevation difference
The cooling capacity and heating capacity for this system are found as shown below.)

● Cooling operation
From the graph, the base capacity change rate is found to be 92.0%.
96,000 BTU/h × 92.0% = 88,320 BTU/h
(28.1kW × 92.0% = 25.8kW) Capacity change rate is 92.0%. Cooling capacity is 88,320 BTU/h (28.1 kW)

● Heating operation
From the graph, the base capacity change rate is found to be 97.2%.
Because the calculation result exceeds 97.2%, the capacity change rate is 97.2%.
108,000 BTU/h × 97.2% = 105,000 BTU/h
(31.6kW × 97.2% = 30.7kW) Heating capacity is 105,000 BTU/h (30.7 kW)

- If the maximum tubing length (L1) exceeds 295 ft (equivalent length), increase the tubing size of the main liquid, gas tubes(LM) by one rank.
  However, the upper limit for the gas tube size is ø1-3/8".
- Increasing the tubing size of the gas tubes can reduce the loss of capacity caused by longer tubing lengths.
  Refer to Table 2-11 to increase the tubing size. However, the maximum allowable tubing length must not be exceeded.

* The amount of additional refrigerant charge is determined from the liquid tube size only.

Table 2-10 Correction coefficient for equivalent length when the size of the gas tube (LM) is increased

Standard tube diameter (gas tube, in.(mm))	ø1/2" (ø12.7)	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)
Tube diameter after change (gas tube, in.(mm))	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)	ø1-3/8" (ø34.92)
Equivalent length correction coefficient	0.4		0.5		0.6

* When increasing the size of the suction and discharge tubing (LM), multiply by the correction coefficient from Table 2-11 and calculate the equivalent length for section LM.

Tubing equivalent length after size increase = Standard tubing equivalent length × Equivalent length correction coefficient

Table 2-11 Dimensions for connections of each part Unit: in.

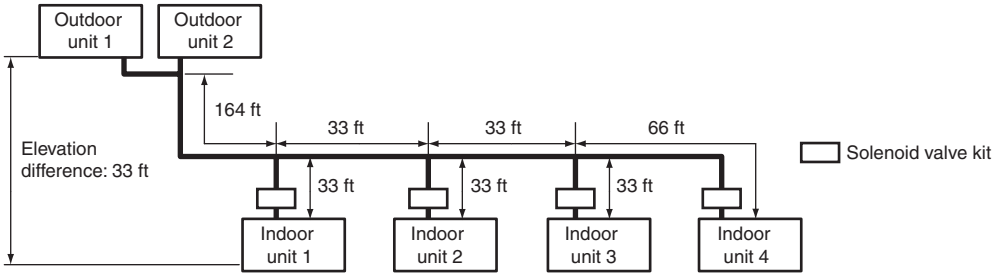
Position	A	B	C	D	E	F	G	H	I	J
Dimension	ø1-1/2"	ø1-1/4"	ø1-1/8"	ø1"	ø7/8"	ø3/4"	ø5/8"	ø1/2"	ø3/8"	–

2. System Design

2-1. System Example

(1) Below are the tables created using the "PAC System Diagram Software." Details of the calculations are shown in (2).

As the maximum tubing length (equivalent length) is over 295ft. in the following selection sample, the item (3) is applied due to the main tube size up.



Selection conditions

		Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Cooling	Air condition (DB/WB)	91.0 / 72.0	78.0 / 64.0	78.0 / 64.0	78.0 / 64.0	78.0 / 64.0
	Max. load (BTU/h)	———	50,000	30,000	30,000	18,500
Heating	Air condition (DB/WB)	37.0 / 35.0	69.0 / 55.0	69.0 / 55.0	69.0 / 55.0	69.0 / 55.0
	Max. load (BTU/h)	———	55,000	35,000	35,000	20,000
Actual tubing length		296 ft	197 ft	230 ft	263 ft	296 ft
Equivalent length (with consideration for curves, etc.) [* Equivalent length after size-up correction]		355.2 ft [276.5 ft]	236.4 ft [157.7 ft]	276.0 ft [197.3 ft]	315.6 ft [236.9 ft]	355.2 ft [276.5 ft]

* Equivalent length after size-up correction is used for the calculation of actual capacity.

Preliminary selection

	Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model	Type 96 + 72	Type 54	Type 36	Type 36	Type 18
Load (cooling/heating) (BTU/h)	———	50,000 / 55,000	30,000 / 35,000	30,000 / 35,000	18,500 / 20,000
Rated capacity (cooling/heating) (BTU/h)	168,000 / 189,000	54,600 / 61,400	36,000 / 39,000	36,000 / 39,000	19,000 / 21,000
(5) Corrected capacity (cooling/heating) (BTU/h)	147,532.93 / 146,812.33	54,600.00 / 61,768.40	35,781.01 / 39,234.00	34,941.99 / 39,234.00	18,000.59 / 21,126.00
(7) Actual capacity (cooling/heating) (BTU/h)	———	54,600.00 / 56,752.81	35,781.01 / 36,048.20	34,941.99 / 36,048.20	18,000.59 / 19,410.57

Total corrected capacity of indoor units (cooling/heating) = 143,323.59/161,362.40

Ruc = 143,323.59/147,532.93 = 0.971 < 1 Ruh = 161,362.40/146,812.33 = 1.099 > 1

Outdoor unit changes

The corrected outdoor unit capacity is less than the total corrected capacity of all indoor units in the system. As a result, the actual capacity of each indoor unit is less than the maximum load. Therefore the outdoor unit is increased by one rank.

	Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model	Type 96 + 96	Type 54	Type 36	Type 36	Type 18
Load (cooling/heating) (BTU/h)	———	50,000 / 55,000	30,000 / 35,000	30,000 / 35,000	18,500 / 20,000
Rated capacity (cooling/heating) (BTU/h)	192,000 / 216,000	54,600 / 61,400	36,000 / 39,000	36,000 / 39,000	19,000 / 21,000
(5) Corrected capacity (cooling/heating) (BTU/h)	168,609.06 / 173,189.02	54,600.00 / 61,768.40	35,781.01 / 39,234.00	34,941.99 / 39,234.00	18,000.59 / 21,126.00
(7) Actual capacity (cooling/heating) (BTU/h)	———	54,600.00 / 61,400.00	35,781.01 / 39,000.00	34,941.99 / 39,000.00	18,000.59 / 21,000.00

Total corrected capacity of indoor units (cooling/heating) = 143,323.59/161,362.40

Ruc = 143,323.59/168,609.06 = 0.850 < 1 Ruh = 161,362.40/173,189.02 = 0.932 < 1

Indoor unit changes

The indoor unit in room 4, where the corrected indoor unit capacity is less than the maximum load, is increased by one rank.

	Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Selected model	Type 96 + 96	Type 54	Type 36	Type 36	Type 24
Load (cooling/heating) (BTU/h)	———	50,000 / 55,000	30,000 / 35,000	30,000 / 35,000	18,500 / 20,000
Rated capacity (cooling/heating) (BTU/h)	192,000 / 216,000	54,600 / 61,400	36,000 / 39,000	36,000 / 39,000	25,000 / 27,000
(5) Corrected capacity (cooling/heating) (BTU/h)	168,609.06 / 173,189.02	54,600.00 / 61,768.40	35,781.01 / 39,234.00	34,941.99 / 39,234.00	23,684.99 / 27,162.00
(7) Actual capacity (cooling/heating) (BTU/h)	———	54,600.00 / 61,400.00	35,781.01 / 39,000.00	34,941.99 / 39,000.00	23,684.99 / 27,000.00

Total corrected capacity of indoor units (cooling/heating) = 149,008.00/167,398.40
Ruc = 149,008.00/168,609.06 = 0.884 < 1 Ruh = 167,398.40/173,189.02 = 0.967 < 1

- For both cooling and heating in all rooms, actual capacity is now greater than or equal to the maximum load. Selection is completed.

(2) Calculate the final selection results according to the capacity calculation procedure.

[From calculation of the correction coefficient to calculation of actual capacity] (Cooling/heating)

		Outdoor unit	Room 1 (indoor unit 1)	Room 2 (indoor unit 2)	Room 3 (indoor unit 3)	Room 4 (indoor unit 4)
Rated capacity (BTU/h)		192,000 / 216,000	54,600 / 61,400	36,000 / 39,000	36,000 / 39,000	25,000 / 27,000
Correction coefficient	(1) Model	1.0000 / 1.0000	———	———	———	———
	(2) Temp. condition	1.0203 / 1.0000	0.9474 / 1.0060	0.9474 / 1.0060	0.9474 / 1.0060	0.9474 / 1.0060
	(3) Tubing length, elevation difference	0.8607 / 0.9009	0.9240 / 0.9461	0.9030 / 0.9311	0.8818 / 0.9159	0.8607 / 0.9009
	Distribution ratio	———		1.0491 / 1.0335	1.0245 / 1.0167	1.0000 / 1.0000
	(4) Frosting/defrosting	0.8900	———	———	———	———
Result of (2) × (3)		———	1.0171 / 1.0565	0.9939 / 1.0397	0.9706 / 1.0228	0.9474 / 1.0060
Correction coefficient applied to indoor unit *1		———	1.0000 / 1.0000	0.9939 / 1.0000	0.9706 / 1.0000	0.9474 / 1.0000
(5) Corrected capacity (BTU/h) *2		168,609.06 / 173,189.02	54,600.00 / 61,768.40	35,781.01 / 39,234.00	34,941.99 / 39,234.00	23,684.99 / 27,162.00
(6) Correction coefficient for corrected capacity ratio		———	1.0000 / 1.0000	1.0000 / 1.0000	1.0000 / 1.0000	1.0000 / 1.0000
(7) Actual capacity (BTU/h)		———	54,600.00 / 61,400.00	35,781.01 / 39,000.00	34,941.99 / 39,000.00	23,684.99 / 27,000.00

*1: This varies depending on the values of (2) and (2) × (Distribution ratio in (3)).
*2: Corrected outdoor unit capacity = Rated outdoor unit capacity × (1) × (2) × (3) × (4)

The actual capacity is calculated as shown below.

Cooling: Ruc = (54,600.00 + 35,781.01 + 34,941.99 + 23,684.99) / 168,609.06 = 0884 < 1
Therefore,
Actual cooling capacity of each indoor unit = Corrected cooling capacity of each indoor unit
(In other words, the correction coefficient (6) for the corrected capacity ratio is 1.)

Heating: Ruh = (61,768.40 + 39,234.00 + 39,234.00 + 27,162.00) / 173,189.02 = 0.967 < 1
Therefore,
Actual heating capacity of each indoor unit = Corrected heating capacity of each indoor unit
(In other words, the correction coefficient (6) for the corrected capacity ratio is 1.)

(3) Increasing the size of the refrigerant tubing

■ Increasing the tubing size of the gas tubes can reduce the loss of capacity caused by longer tubing lengths. Refer to Table 2-11 to increase the tubing size. However, the maximum allowable tubing length must not be exceeded.

* The amount of additional refrigerant charge is determined from the liquid tube size only.

Table 2-10 Correction coefficient for equivalent length when the size of the gas tube (LM) is increased

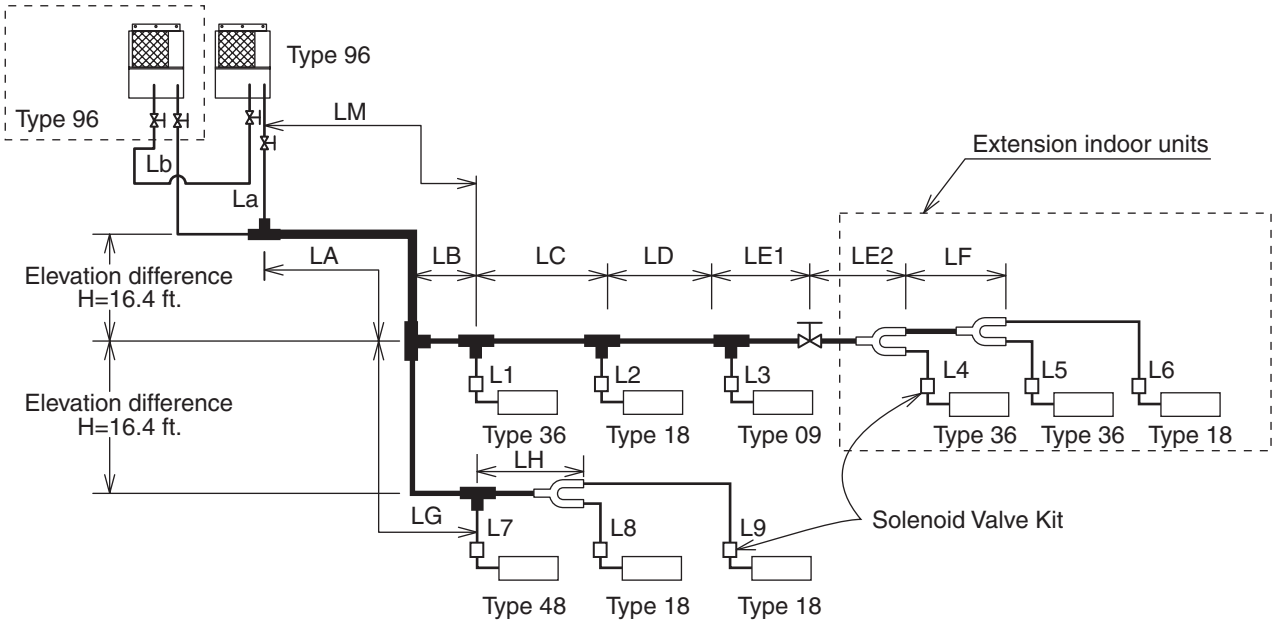
Standard tube diameter (gas tube, in.(mm))	ø1/2" (ø12.7)	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)
Tube diameter after change (gas tube, in.(mm))	ø5/8" (ø15.88)	ø3/4" (ø19.05)	ø7/8" (ø22.22)	ø1-1/8" (ø28.58)	ø1-3/8" (ø34.92)
Equivalent length correction coefficient	0.4		0.5		0.6

* When increasing the size of the suction and discharge tubing (LM), multiply by the correction coefficient from Table 2-11 and calculate the equivalent length for section LM.

Tubing equivalent length after size increase = Standard tubing equivalent length × Equivalent length correction coefficient

2-2. Example of Tubing Size Selection for Extension and Additional Charge Amount

● Sample calculation for the system below



Additional refrigerant charge before extension

	Liquid tube diameter	Tubing length (ft) (A)	Additional refrigerant charge per 1 ft (oz/ft) (B)	(A) × (B) oz
La	ø1/2	6.6	1.38	9.055
Lb	ø3/8	65.6	0.602	39.501
LA	ø3/4	26.2	2.78	72.966
LB	ø1/2	19.7	1.38	27.165
LC	ø1/2	19.7	1.38	27.165
LD	ø1/2	19.7	1.38	27.165
LE1	ø3/8	16.4	0.602	9.875
LG	ø5/8	26.2	1.99	52.231
LH	ø3/8	13.1	0.602	7.900
L1	ø3/8	9.8	0.602	5.925
L2	ø1/4	9.8	0.279	2.746
L3	ø1/4	9.8	0.279	2.746
L7	ø3/8	9.8	0.602	5.925
L8	ø1/4	9.8	0.279	2.746
L9	ø1/4	13.1	0.279	3.661
Total (oz)				296.775 → 297 oz

Additional refrigerant charge after extension

	Liquid tube diameter	Tubing length (ft) (A)	Additional refrigerant charge per 1 ft (oz/ft) (B)	(A) × (B) oz
LE2	ø3/8	13.1	0.602	7.900
LF	ø3/8	16.4	0.602	9.875
L4	ø3/8	13.1	0.602	7.900
L5	ø3/8	19.7	0.602	11.850
L6	ø1/4	23.0	0.279	6.407
Total (oz)				43.934 → 44 oz

Calculation of additional refrigerant charge for the entire 3WAY VRF system
(Additional refrigerant charge for entire 3WAY VRF system)
= (Refrigerant charge at outdoor unit) + (Additional refrigerant charge)
= 881 + 341 = 1222 oz (after extension)
[Before extension: 458 + 297 = 755 oz]

Remark:
When planning an extension model, be sure to include the values of the Table 2-1-1 (Page 2-5) Necessary Amount of Refrigerant Charge per Outdoor Unit.

WARNING **Always check the gas density limit for the room in which the unit is installed.**

■ Checking of limit density

When installing an air conditioner in a room, it is necessary to ensure that even if the refrigerant gas accidentally leaks out, its density does not exceed the limit level for that room.

2-3. Installing Distribution Joint

CAUTION

Pay special attention to any location, such as a basement, etc., where leaking refrigerant can accumulate, since refrigerant gas is heavier than air.

(1) Refer to "HOW TO ATTACH DISTRIBUTION JOINT" enclosed with the optional distribution joint kit (CZ-P900PH1U, P224BH1U, P680BH1U, P1350BH1U).

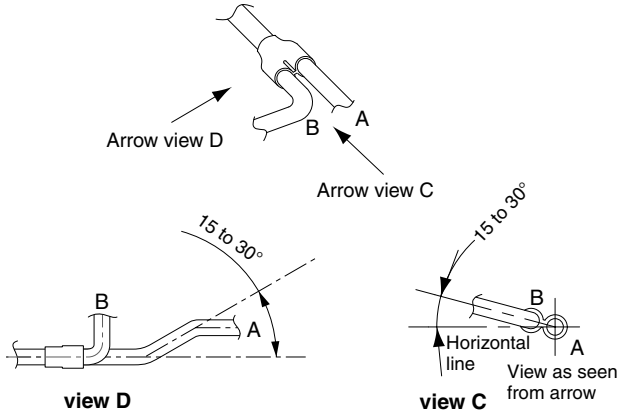
(2) When creating a branch using a commercially available T-joint (header joint system), orient the main tubing so that it is either horizontal (level) or vertical. In order to prevent accumulation of refrigerant oil in stopped units, if the main tubing is horizontal then each branch tubing length "B" should be at an angle that is greater than horizontal. If the main tubing is vertical, provide a raised starting portion for each branch.
When only one indoor unit is connected to the side of "A" install part "A" at a positive angle (15-30°) for the field tubing as shown in the figure.

[Header joint system]

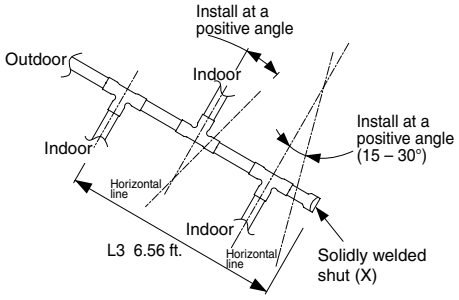
- Be sure to solidly weld shut the T-joint end (marked by "X" in the figure). In addition, pay attention to the insertion depth of each connected tube so that the flow of refrigerant within the T-joint is not impeded.
- When using the header joint system, do not make further branches in the tubing.
- Do not use the header joint system on the outdoor unit side.

(3) If there are height differences between indoor units or if branch tubing that follows a distribution joint is connected to only 1 unit, a trap or ball valve must be added to that distribution joint. (When adding the ball valve, locate it within 15 - 3/4" of the distribution joint.)
If a trap or ball valve is not added, do not operate the system before repairs to a malfunctioning unit are completed. (The refrigerant oil sent through the tubing to the malfunctioning unit will accumulate and may damage the compressor.)

Tube branching methods (horizontal use)

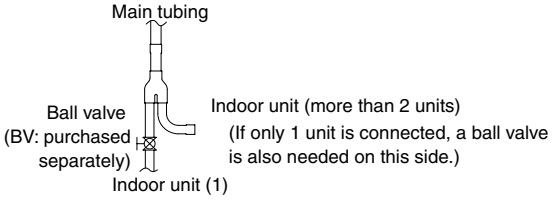


Header joint system (Indoor)

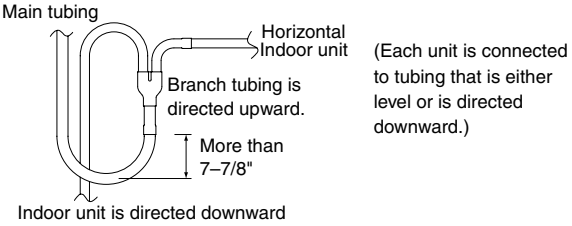


Types of vertical trap specifications

(When using ball valve)


Main tubing
Ball valve
(BV: purchased separately)
Indoor unit (more than 2 units)
(If only 1 unit is connected, a ball valve is also needed on this side.)
Indoor unit (1)

(When not using ball valve)


Main tubing
Horizontal
Indoor unit
Branch tubing is directed upward.
More than 7–7/8"
Indoor unit is directed downward
(Each unit is connected to tubing that is either level or is directed downward.)

3. Electrical Wiring

3-1. General Precautions on Wiring

(1) Before wiring, confirm the rated voltage of the unit as shown on its nameplate, then carry out the wiring closely following the wiring diagram.
(2) Provide a power outlet to be used exclusively for each unit, and a power supply disconnect, circuit breaker and earth leakage breaker for overcurrent protection should be provided in the exclusive line.
(3) To prevent possible hazards from insulation failure, the unit must be grounded.
(4) Each wiring connection must be done in accordance with the wiring system diagram. Wrong wiring may cause the unit to misoperate or become damaged.
(5) Do not allow wiring to touch the refrigerant tubing, compressor, or any moving parts of the fan.
(6) Unauthorized changes in the internal wiring can be very dangerous. The manufacturer will accept no responsibility for any damage or misoperation that occurs as a result of such unauthorized changes.
(7) Regulations on wire diameters differ from locality to locality. For field wiring rules, please refer to your LOCAL ELECTRICAL CODES before beginning.
You must ensure that installation complies with all relevant rules and regulations.
(8) To prevent malfunction of the air conditioner caused by electrical noise, care must be taken when wiring as follows:
- The remote control wiring and the inter-unit control wiring should be wired apart from the inter-unit power wiring.
- Use shielded wires for inter-unit control wiring between units and ground the shield on both sides.

(9) If the power supply cord of this appliance is damaged, it must be replaced by a repair shop appointed by the manufacture, because special purpose tools are required.

3-2. Recommended Wire Length and Wire Diameter for Power Supply System

Outdoor unit

	Time delay fuse or circuit capacity
U-72MF1U9 U-72MF1U9E	40 A
U-96MF1U9 U-96MF1U9E	45 A

Indoor unit

Type	Time delay fuse or circuit capacity
K1	10 – 16 A
D1, U1, Y1, F1, M1, T1, P1, R1	10 – 16 A
E1	10 – 16 A

Control wiring

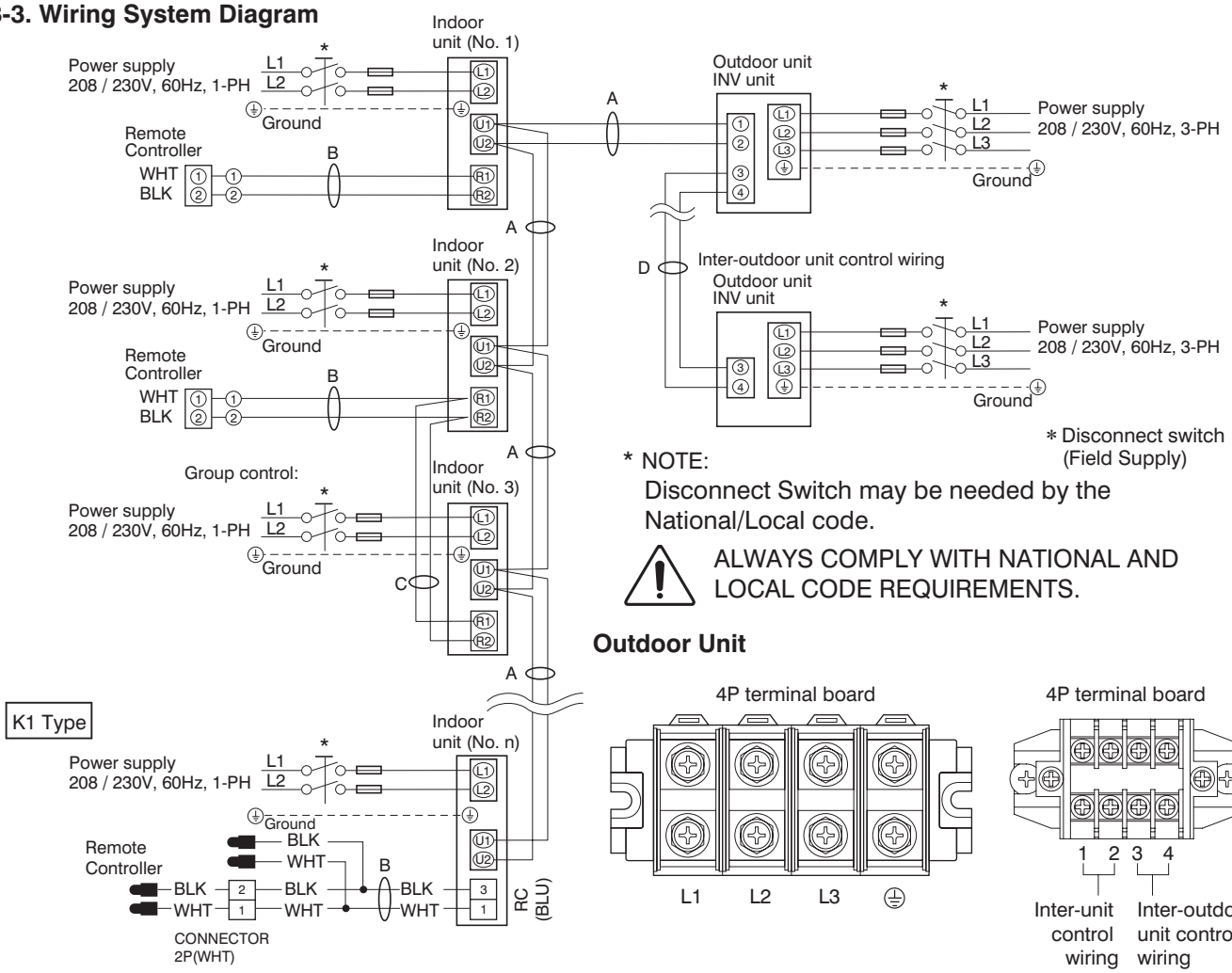
(A) Inter-unit (between outdoor and indoor units) control wiring*	(B) Remote control wiring	(C) Control wiring for group control
AWG #18 (0.75 mm^2)	AWG #18 (0.75 mm^2)	AWG #18 (0.75 mm^2)
Max. 3,280 ft.	Max. 1,640 ft.	Max. 650 ft. (Total)

(D) Inter-outdoor unit control wiring
AWG #18 (0.75 mm^2)
Max. 980 ft.

NOTE

* With ring-type wire terminal.

3-3. Wiring System Diagram



* NOTE:
Disconnect Switch may be needed by the National/Local code.

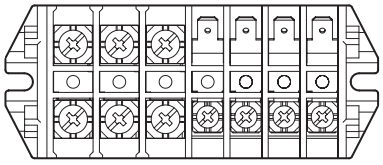
ALWAYS COMPLY WITH NATIONAL AND LOCAL CODE REQUIREMENTS.

Outdoor Unit

Indoor Unit

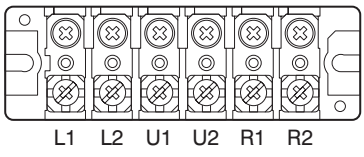
U1, E1 Types

7P terminal board



Y1, D1, T1, F1, M1, P1, R1 Types

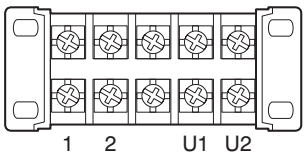
6P terminal board



K1 Type

Model : S-07MK1U6
S-09MK1U6
S-12MK1U6

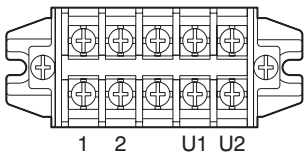
5P terminal board



K1 Type

Model : S-18MK1U6
S-19MS1U6
S-24MK1U6

5P terminal board



NOTE

(1) Refer to Section 2 “3-2. Recommended Wire Length and Wire Diameter for Power Supply System” for the explanation of “A,” “B,” “C,” and “D,” in the above diagram.

(2) The basic connection diagram of the indoor unit shows the 7P terminal board, so the terminal boards in your equipment may differ from the diagram.

(3) Refrigerant Circuit (R.C.) address should be set before turning the power on.

(4) Regarding the R.C. address setting, refer to Section 5 "TEST RUN." Address setting can be executed by remote controller automatically.

3. Electrical Wiring

CAUTION

(1) When linking outdoor units in a network, disconnect the terminal extended from the short plug (CN003, 2P Black, location: right bottom on the outdoor main control PCB) from all outdoor units except any one of the outdoor units. (When shipping: In shorted condition.)
For a system without link (no connection wiring between outdoor units), do not remove the short plug.

(2) Do not install the inter-unit control wiring in a way that forms a loop. (Fig. 2-1)

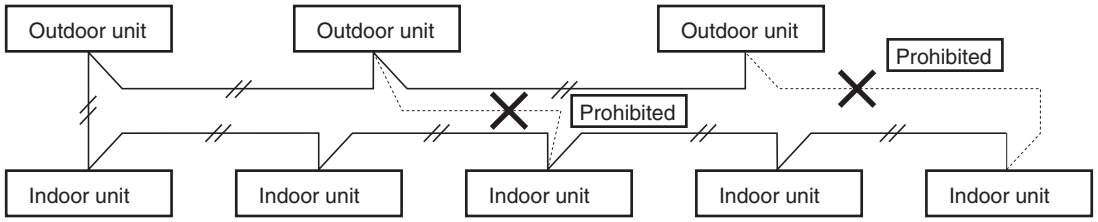


Fig. 2-1

(3) Do not install inter-unit control wiring such as star branch wiring. Star branch wiring causes mis-address setting. (Fig. 2-2)

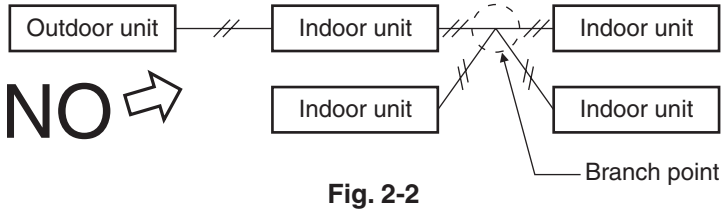


Fig. 2-2

(4) If branching the inter-unit control wiring, the number of branch points should be 16 or fewer. (Branches less than 3.3 ft. are not included in the total branch number.) (Fig. 2-3)

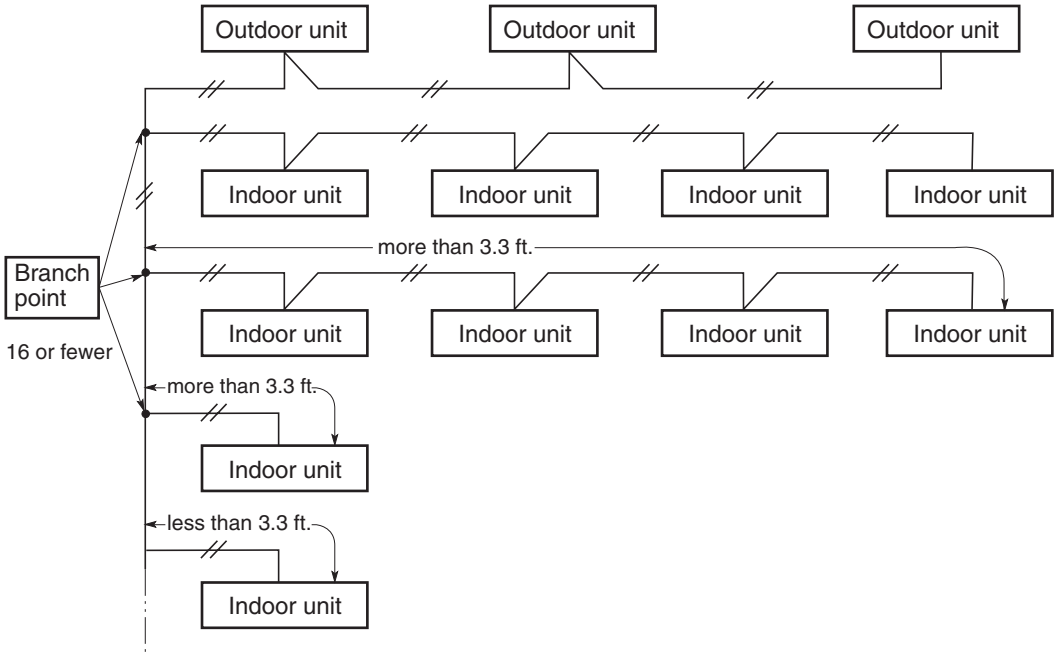


Fig. 2-3

3. Electrical Wiring

WARNING

Loose wiring may cause the terminal to overheat or result in unit malfunction. A fire hazard may also exist. Therefore, ensure that all wiring is tightly connected.

When connecting each power wire to the terminal, follow the instructions on “How to connect wiring to the terminal” and fasten the wire securely with the fixing screw of the terminal plate.

How to connect wiring to the terminal

■ **For stranded wiring**

(1) Cut the wire end with cutting pliers, then strip the insulation to expose the stranded wiring approx. 3/8" and tightly twist the wire ends. (Fig. 2-4)

(2) Using a Phillips head screwdriver, remove the terminal screw(s) on the terminal plate.

(3) Using a ring connector fastener or pliers, securely clamp each stripped wire end with a ring pressure terminal.

(4) Place the ring pressure terminal, and replace and tighten the removed terminal screw using a screwdriver. (Fig. 2-5)

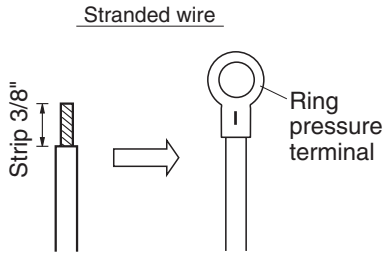


Fig. 2-4

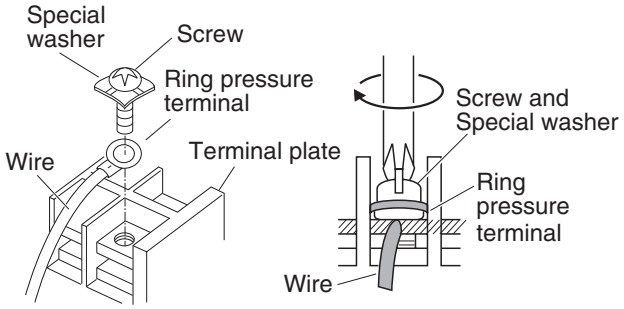


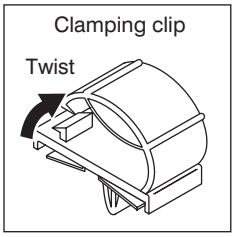
Fig. 2-5

2

3-4. Important Note When Wiring for Common Type

Connect the wires referring to the diagram.
Note that the control wirings (Low voltages) shall be segregated from the power supply wires (High voltage) as follows:

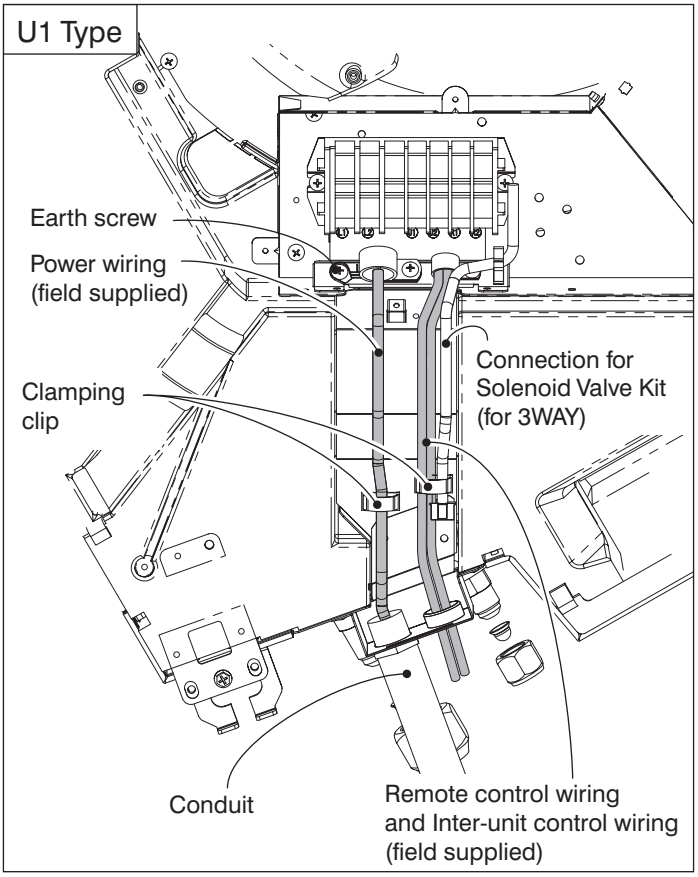
1. Connect the Inter-unit control wiring to U1/U2 terminals and the remote control wire to R1/R2. (excepting K1 type).
2. Connect the power supply wires to “L1, L2” of the terminal block. Be sure to connect the grounding conductor of the incoming power supply to the earth (ground) screw.
3. Securely affix the power supply wires and remote control wires by the clamping strap or clamping clip not to cross each other and not to leave the wirings loose. When loosening the clamping clip, twist the strap and it will come undone.



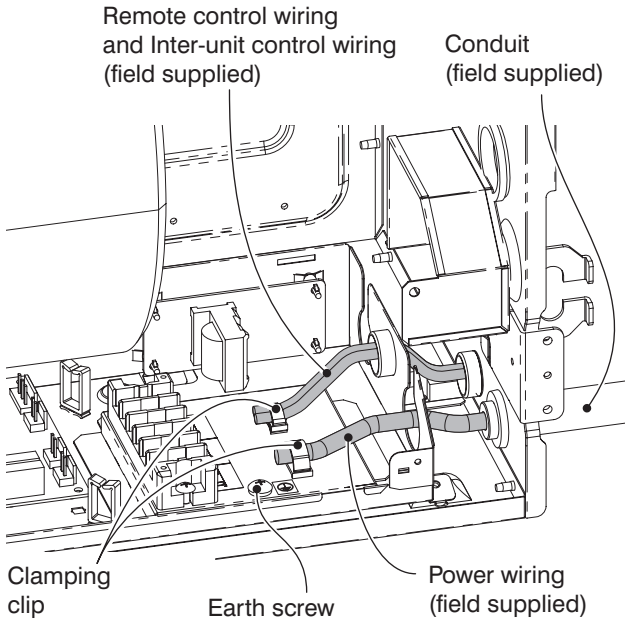
NOTE

Securely affix the 3-way wiring harness with the remote control wiring (U1 type).

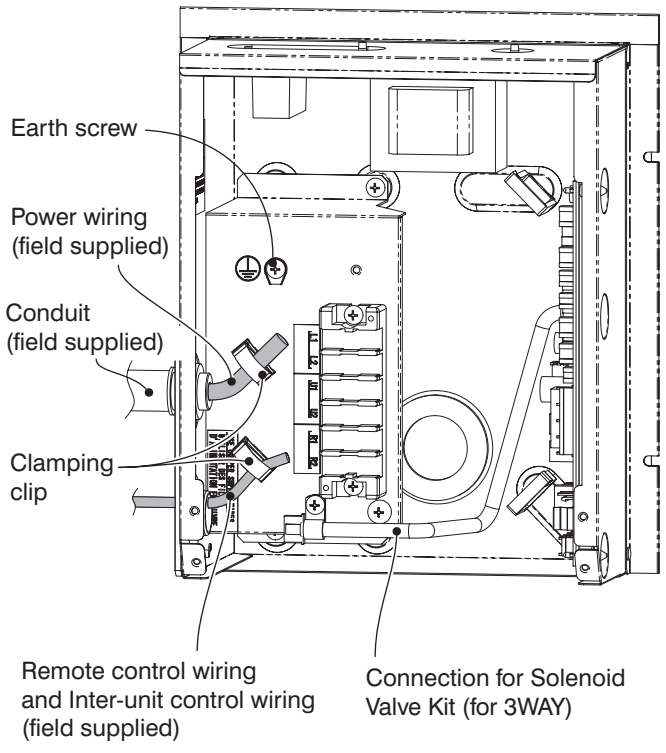
U1 Type



D1 Type

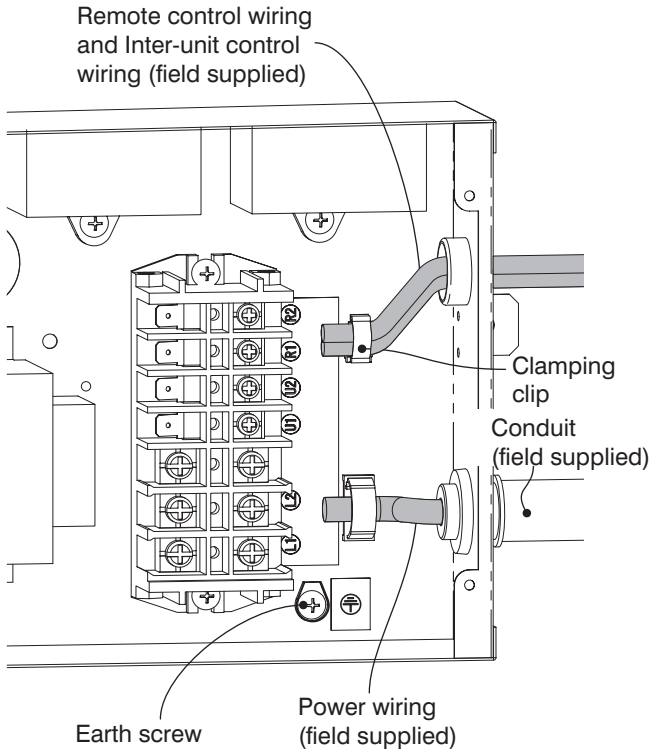


F1 Type

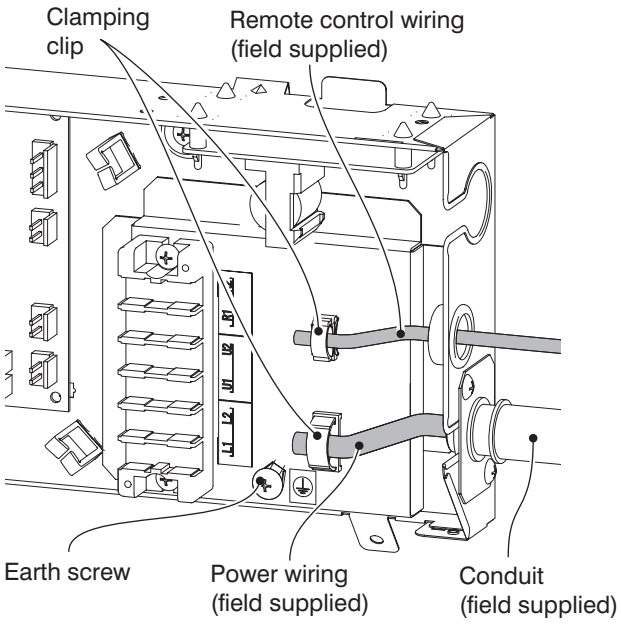


Important Note When Wiring for Common Type (Continued)

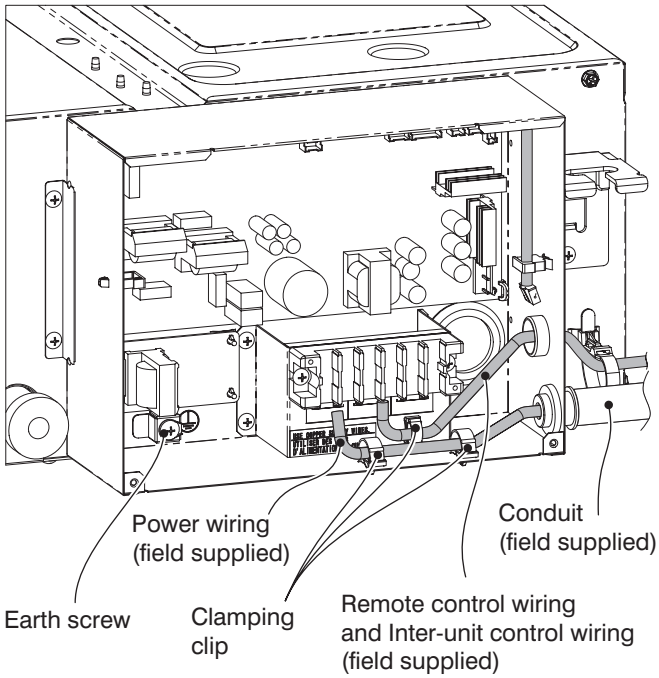
E1 Type



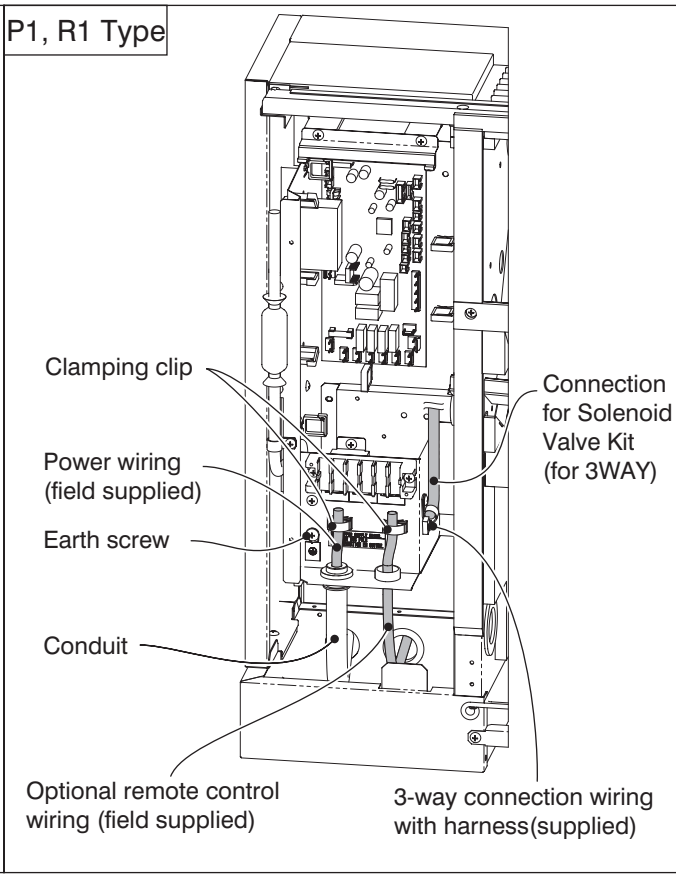
T1 Type



M1 Type



P1, R1 Type

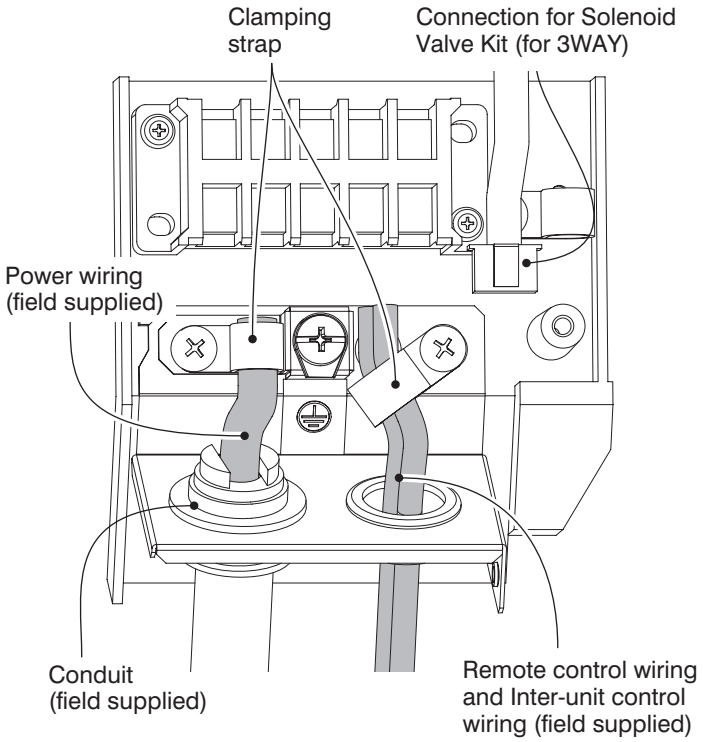


2

Important Note When Wiring for Common Type (Continued)

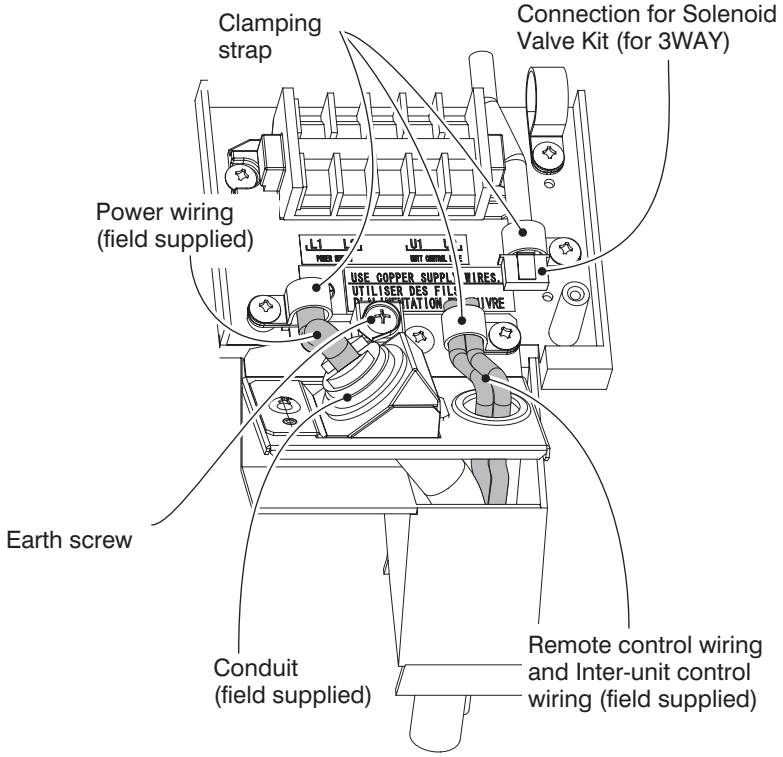
K1 Type

Model : S-07MK1U6
S-09MK1U6
S-12MK1U6


Clamping strap
Connection for Solenoid Valve Kit (for 3WAY)
Power wiring (field supplied)
Conduit (field supplied)
Remote control wiring and Inter-unit control wiring (field supplied)

K1 Type

Model : S-18MK1U6
S-19MS1U6*
S-24MK1U6

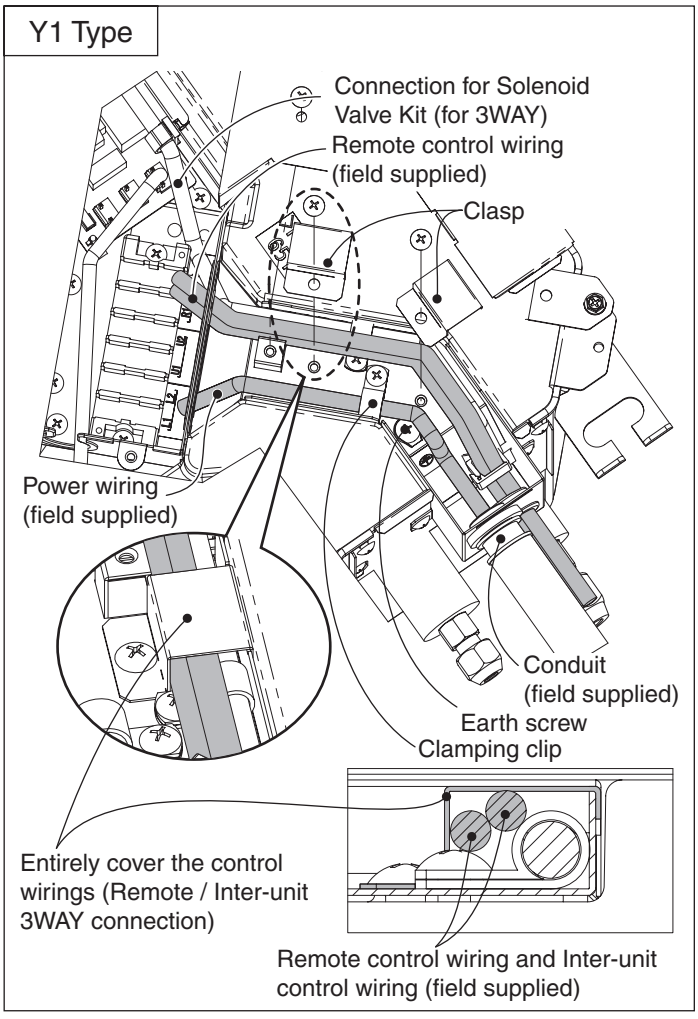

Clamping strap
Connection for Solenoid Valve Kit (for 3WAY)
Power wiring (field supplied)
Earth screw
Conduit (field supplied)
Remote control wiring and Inter-unit control wiring (field supplied)

* Necessary to install the External Electronic Expansion Valve Kit (Optional : CZ-P56SVK1U)

3-5. Important Note When Wiring for Y1 Type

Connect the wires referring to the diagram.
Note that the control wirings (Low Voltages) shall be segregated from the power supply wires (High Voltage) as follows:

1. Connect the Inter-unit control wiring to U1/U2 terminals and the remote control wire to R1/R2. Then place and fix the two clasps so that the clasps shall cover both the remote control wires, the Inter-unit control wiring and the 3-way wiring harness as shown in the magnified drawing.
2. Connect the grounding conductor of the incoming power supply to the earth (ground) screw before connecting the power supply conductors to “L1, L2” of the terminal block.
3. Securely affix the two power supply conductors (L1, L2) in the wiring channel by the clamping strap as shown.


Y1 Type
Connection for Solenoid Valve Kit (for 3WAY)
Remote control wiring (field supplied)
Clasp
Power wiring (field supplied)
Conduit (field supplied)
Earth screw
Clamping clip
Entirely cover the control wirings (Remote / Inter-unit 3WAY connection)
Remote control wiring and Inter-unit control wiring (field supplied)

NOTE

Take care not to damage the control wirings by the clasp.
Do not leave the control wirings loose.

4-1. Selecting the Installation Site for Outdoor Unit

AVOID:

- heat sources, exhaust fans, etc.
- damp, humid or uneven locations
- indoors (no-ventilation location)

DO:

- choose a place as cool as possible.
- choose a place that is well ventilated.
- allow enough room around the unit for air intake/ exhaust and possible maintenance.
- use lug bolts or equal to bolt down unit, reducing vibration and noise.

Installation Space

Install the outdoor unit where there is enough space for ventilation. Otherwise the unit may not operate properly. Fig. 2-7 shows the minimum space requirement around the outdoor units when 3 sides are open and only 1 side is shuttered, with open space above the unit. The mounting base should be concrete or a similar material that allows for adequate drainage. Make provisions for anchor bolts, platform height, and other site-specific installation requirements.

- **Leave space open above the unit.**
- **Construct louvers or other openings in the wall, if necessary, to ensure adequate ventilation.**

NOTE

- Do not do any wiring or tubing within 1 ft. of the front panel, because this space is needed as a servicing space for the compressor.
- Ensure a base height of 4 in. or more to ensure that drainage water does not accumulate and freeze around the bottom of the unit.
- If installing a drain pan, install the drain pan prior to installing the outdoor unit.

* Make sure there is at least 6 in. between the outdoor unit and the ground.
Also, the direction of the tubing and electrical wiring should be from the front of the outdoor unit.

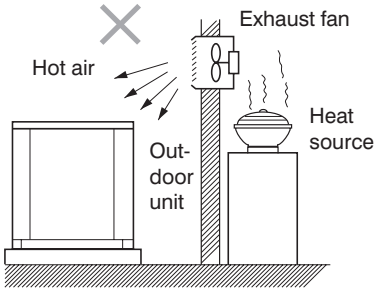
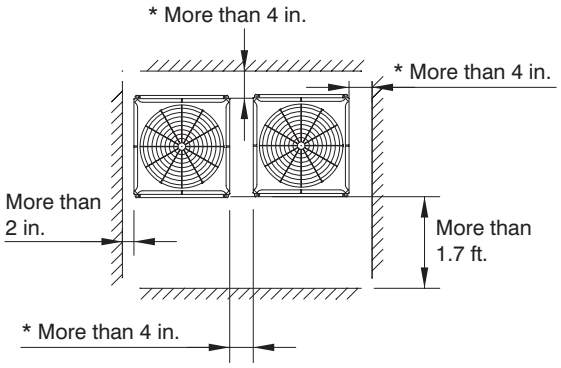


Fig. 2-6

Example of installation of 2 units
(When wall height is below 6 ft.)



* However, be sure to ensure a space of 1 ft. or more at either the right side or the rear of the unit.

Fig. 2-7

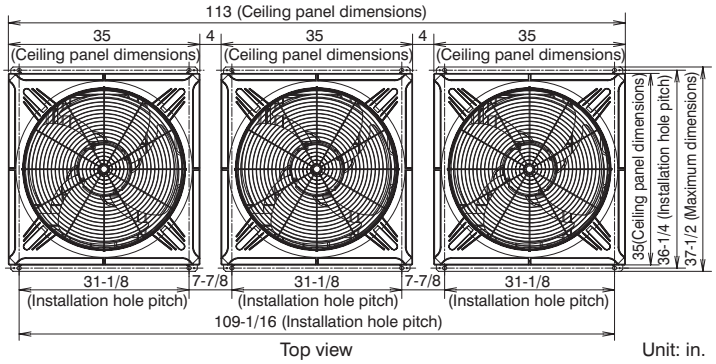


Fig. 2-8

4. Installation Instructions

4-2. Removing Fin Guard for Heat Exchanger

After installation of the outdoor unit, detach the fin guard for heat exchangers as following steps.

1. Cut out the fin guard entirely attached to the panel and remove it from the outdoor unit. Pay careful attention not to damage the fin when cutting out the fin guard.
2. If there is a case where easy to touch the sharp aluminum fin of the outdoor unit, be sure to attach a snow-proof ducting to the unit. It is recommended that the outdoor unit be located away from the touched with hands.

4-3. Shield for Horizontal Exhaust Discharge

It is necessary to install an air-discharge chamber (field supply) to direct exhaust from the fan horizontally if it is difficult to provide a minimum space of 7 ft. between the air-discharge outlet and a nearby obstacle. (Fig. 2-9)

CAUTION

In regions with heavy snowfall, the outdoor unit should be provided with a solid, raised platform and snow-proof ducting (field supply). (Fig. 2-10)

4-4. Installing the Outdoor Unit in Heavy Snow Areas

In locations where wind-blown snow can be a problem, snow-proof ducting (field supply) should be fitted to the unit and direct exposure to the wind should be avoided as much as possible. (Fig. 2-11) The following problems may occur if proper countermeasures are not taken:

- The fan in the outdoor unit may stop running, causing the unit to be damaged.
- There may be no air flow.
- The tubing may freeze and burst.
- The condenser pressure may drop because of strong wind, and the indoor unit may freeze.

4-5. Precautions When Installing in Heavy Snow Areas

a) The platform should be higher than the maximum snow depth. (Fig. 2-10)
b) The 2 anchoring feet of the outdoor unit should be used for the platform, and the platform should be installed beneath the air-intake side of the outdoor unit.
c) The platform foundation must be solid and the unit must be secured with anchor bolts.
d) When installing on a roof subject to strong wind, countermeasures must be taken to prevent the unit from being overturned.

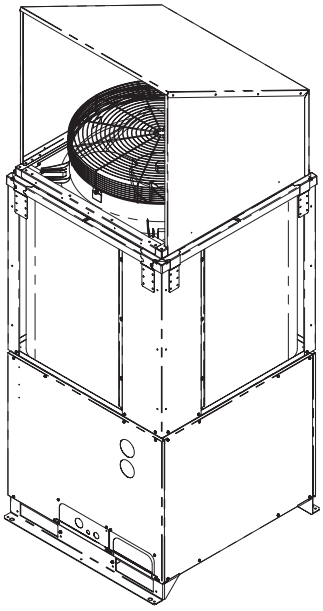
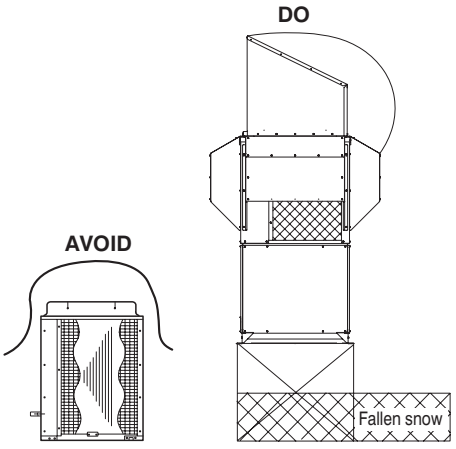


Fig. 2-9



Without snow-proof ducting (Without platform)

With snow-proof ducting (High platform)

Fig. 2-10

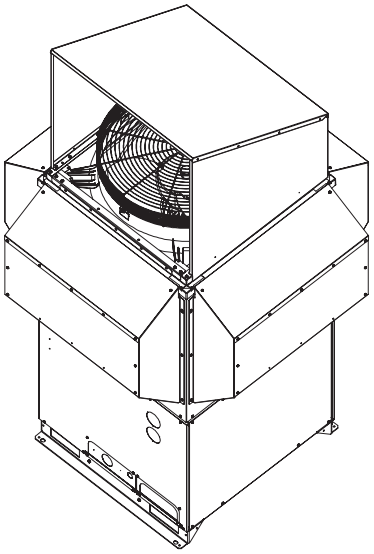
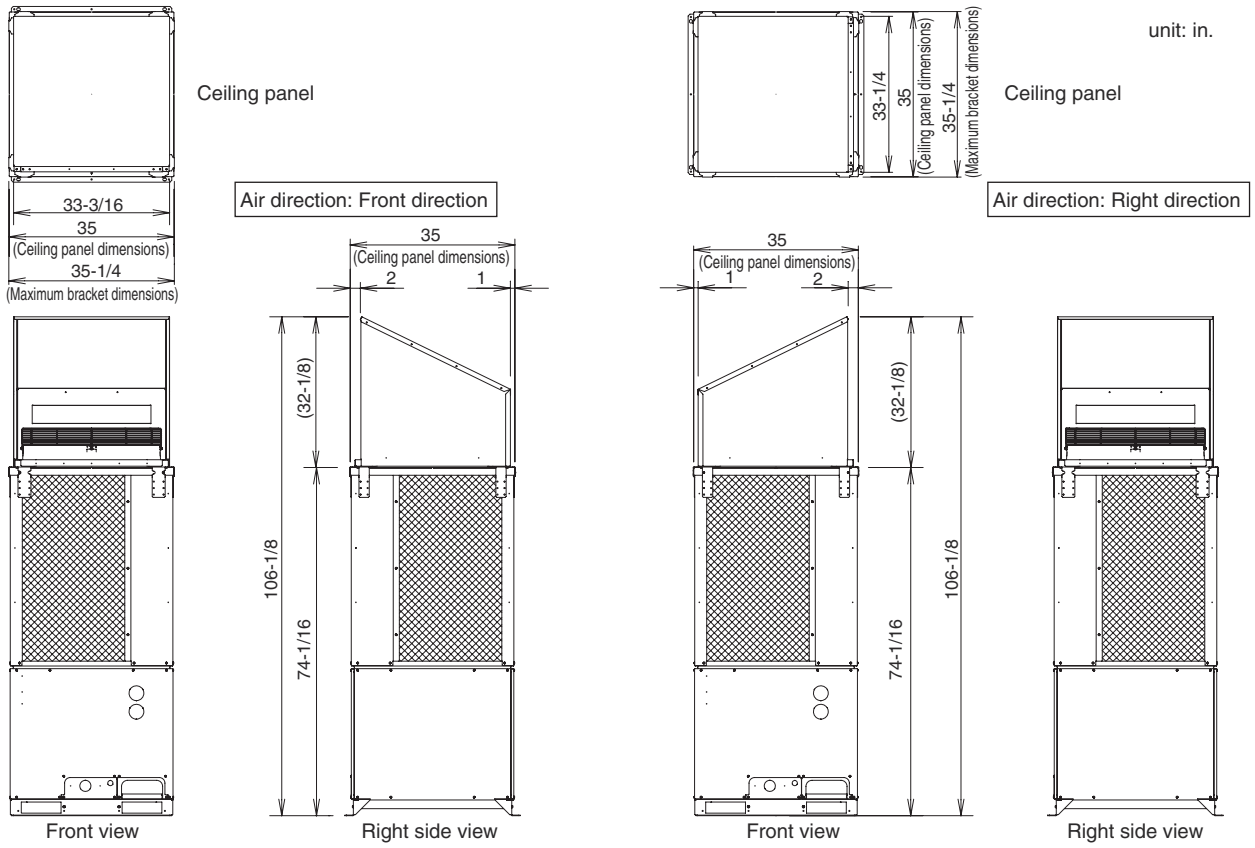


Fig. 2-11

4-6. Dimensions of Wind Ducting

Reference diagram for air-discharge chamber (field supply)

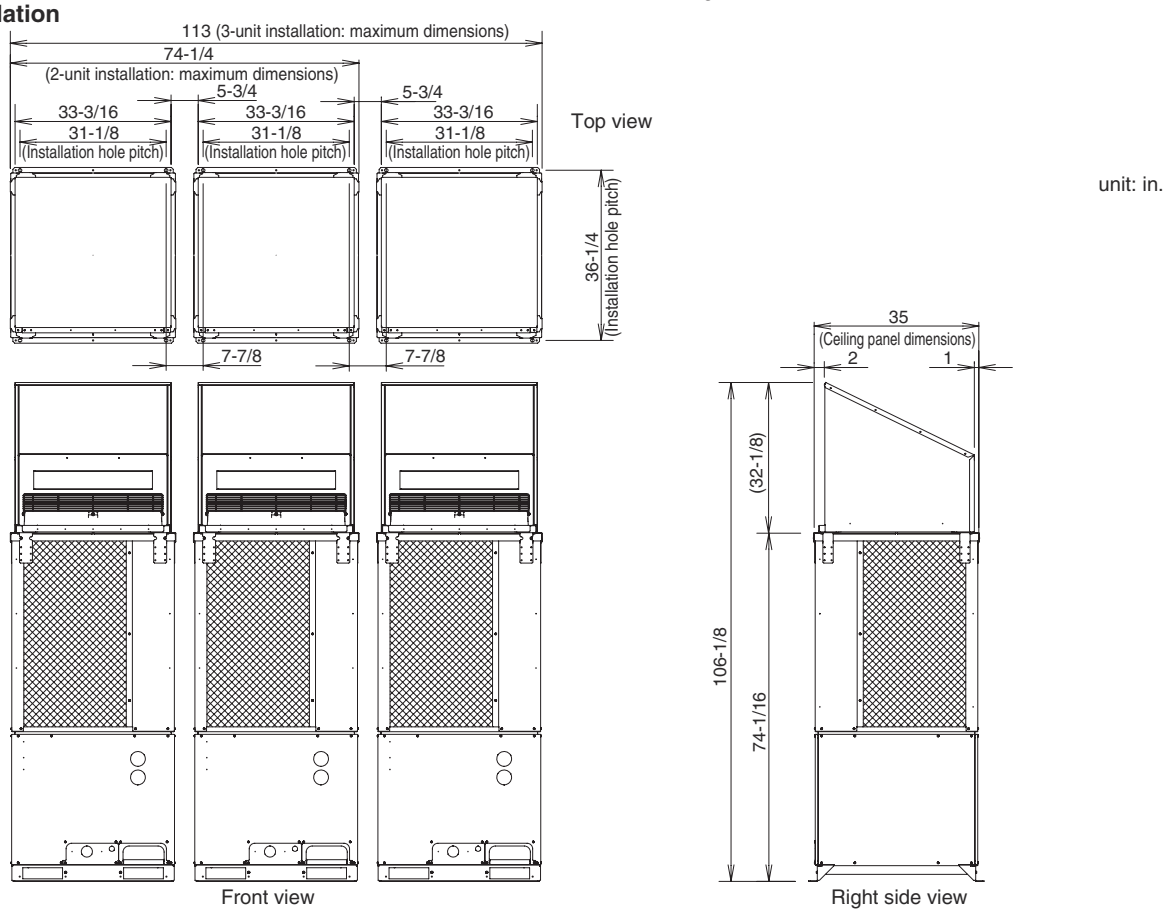
unit: in.



Note: Can be installed so that the air direction is to the front, right, left or rear direction.

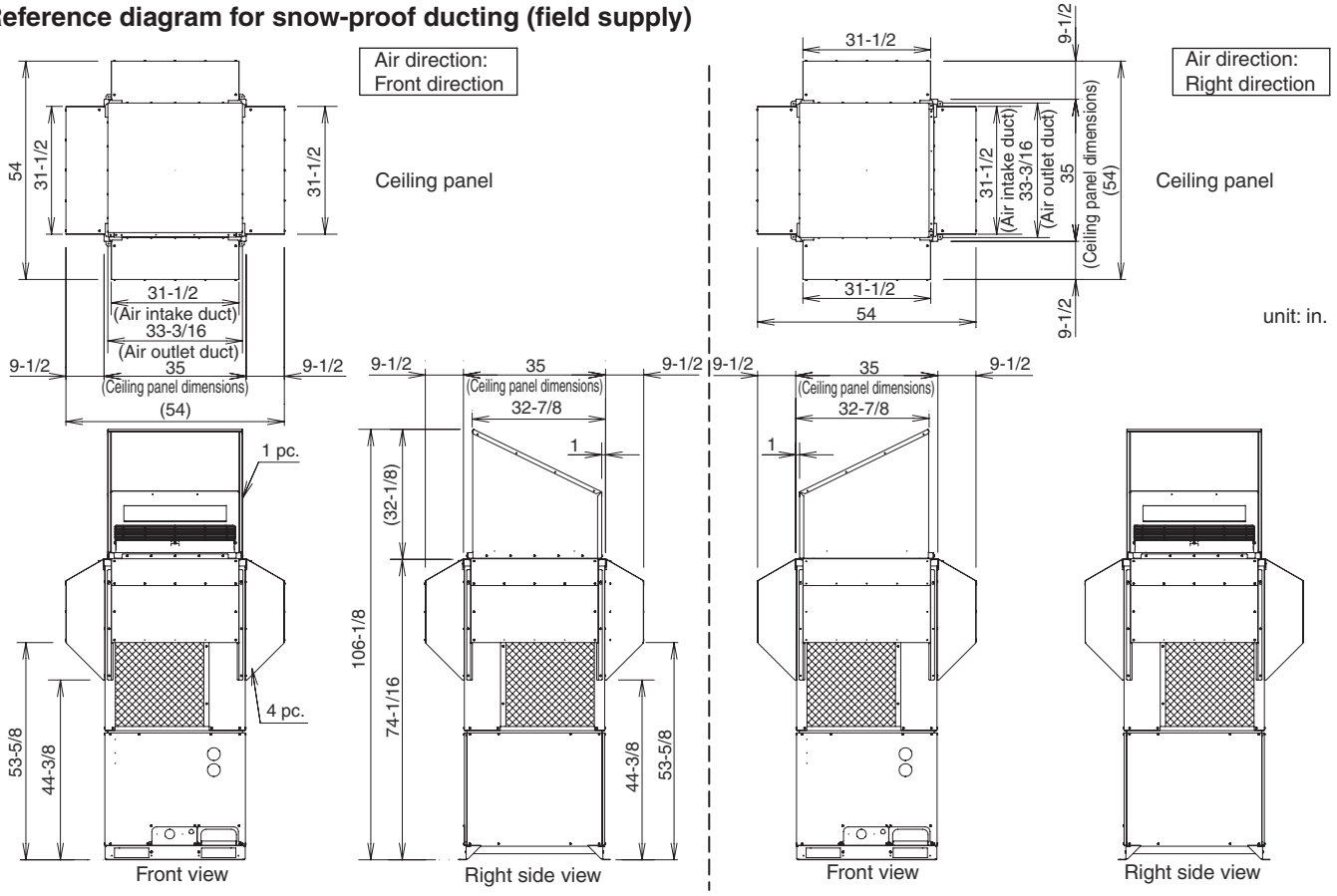
3-unit installation

unit: in.



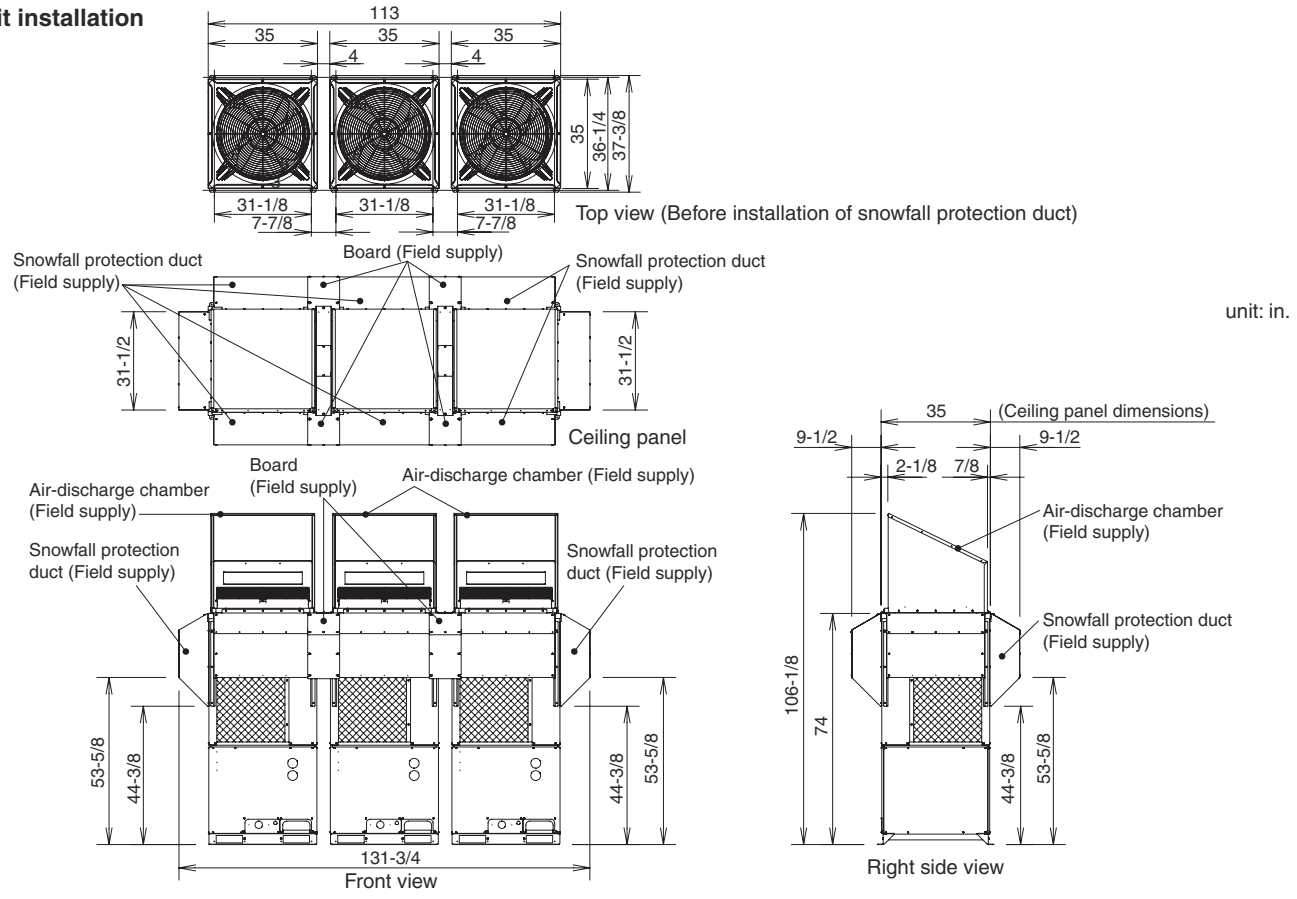
4-7. Dimensions of Snow Ducting

Reference diagram for snow-proof ducting (field supply)



Note: Can be installed so that the air direction is to the front, right, left or rear direction.

3-unit installation



4. Installation Instructions

4-8. Transporting the Outdoor Unit

When transporting the unit, have it delivered as close to the installation site as possible without unpacking. Use a hook for suspending the unit. (Fig. 2-12)

CAUTION

- When hoisting the outdoor unit, pass ropes or straps under the bottom plate as shown in the figure at right. When hoisting, the angle between the rope and top panel must be 70° or greater so that the rope does not come into contact with the fan guard.
  (Use 2 lengths of rope 25 ft. long or longer.)
- When passing the ropes through the square holes of the bottom plate:
  Place the rope in the outer edge of the square holes.
- Use protective panels or padding at all locations where the rope contacts the outer casing or other parts to prevent scratching. In particular, use protective material (such as cloth or cardboard) to prevent the edges of the top panel from being scratched.
- Be careful of the fan.
  There is danger of injury if the fan starts to turn during inspection. Be sure to turn OFF the remote power switch before beginning inspection.

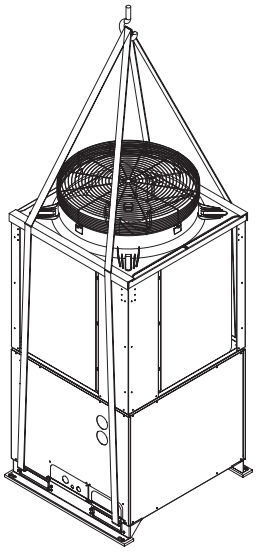
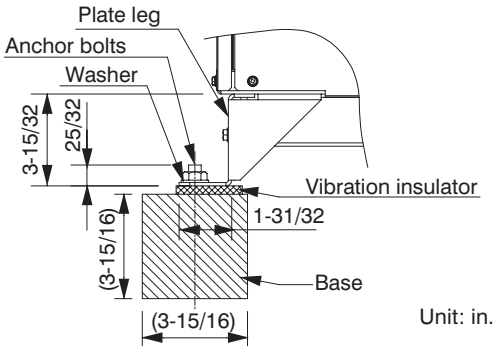


Fig. 2-12

4-9. Installing the Outdoor Unit

(1) Use anchor bolts (M12 or 15/32") or similar to securely anchor the unit in place. (Fig. 2-13)

(2) Be sure the rubber vibration insulator and platform extend to the inside of the legs. In addition, the washers used to anchor the unit from the top must be larger than the installation anchor holes. (Figs. 2-13 and 2-14)



The vibration insulator, base, or platform must be large enough to bear the full surface of the base plate legs.

Fig. 2-13

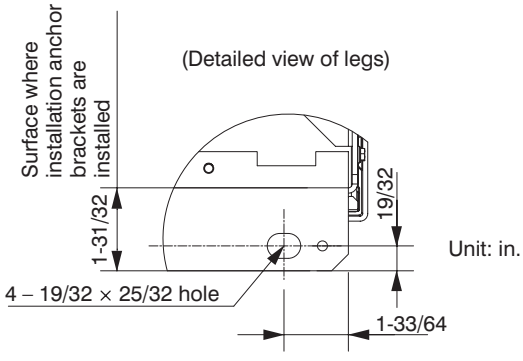


Fig. 2-14

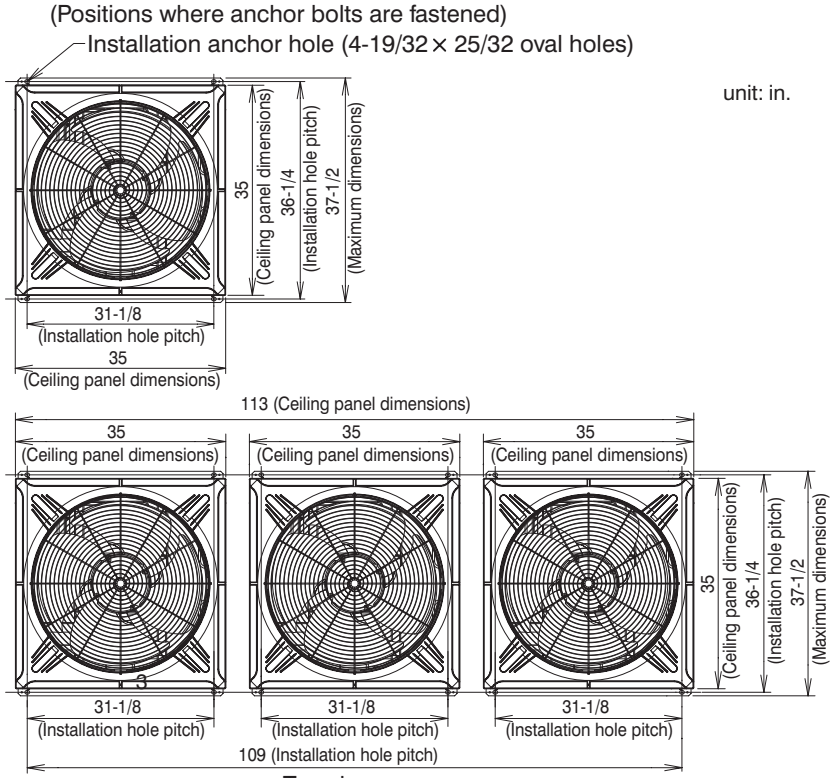


Fig. 2-15

4-10. Remove the Brackets Used for Transport

- After installing the unit, remove the 2 transport brackets from the front and rear (4 brackets total). (Fig. 2-16)

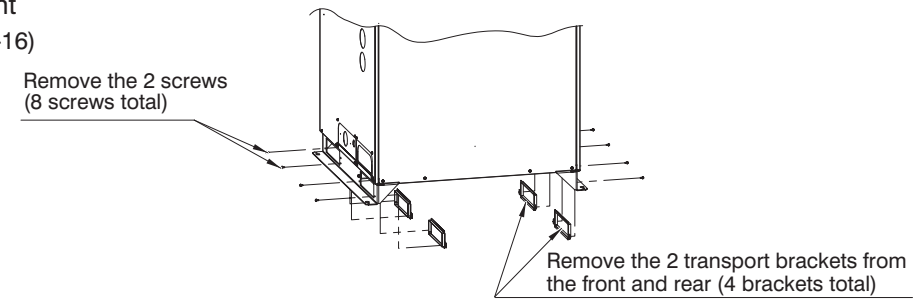


Fig. 2-16

4-11. Routing the Tubing

- The tubing can be routed out either from the front or from the bottom. (Fig. 2-17)
- The connecting valve is contained inside the unit. Therefore, remove the front panel. (Fig. 2-17)

(1) If the tubing is routed out from the front, use cutting pliers or a similar tool to cut out the tubing outlet slit (part indicated by ▨) from the tubing cover. (Figs. 2-17 and 2-18)

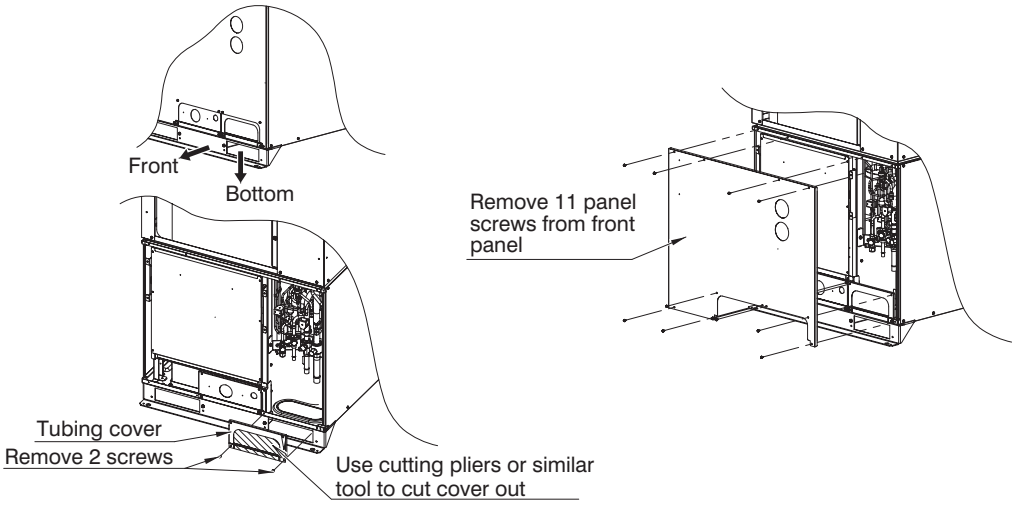


Fig. 2-17

(2) If the tubing is routed out from the bottom, remove the slit part (▨).

- Use a drill bit approximately 13/64" dia. to create holes at the 4 slit hole indentations (openings).
- Punch out the slit part (▨).
- Be careful not to damage the base plate.

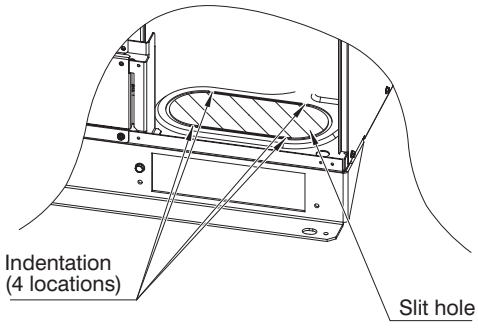


Fig. 2-18

4-12. Prepare the Tubing

- Material: Use C1220 phosphorous deoxidized copper as described in JIS H3300, “Copper and Copper Alloy Seamless Pipes and Tubes.”
  (For tubes that are ø1" (ø25.4 mm) or larger, use 1/2H material or H material. For all others use O material.)
- Tubing size
  Use the tubing size indicated in the table below.
- When cutting the tubing, use a tube cutter, and be sure to remove any burrs.
  (The same applies to distribution tubing (optional).)
- When bending the tubes, bend each tube using a radius that is at least 4 times the outer diameter of the tube.
  When bending, use sufficient care to avoid crushing or damaging the tube.
- For flaring, use a flare tool, and be sure that flaring is performed correctly.

CAUTION

Use sufficient caution during preparation of the tubing. Seal the tube ends by means of caps or taping to prevent dust, moisture, or other foreign substances from entering the tubes.

Refrigerant tubing (Existing tubing can be used.)

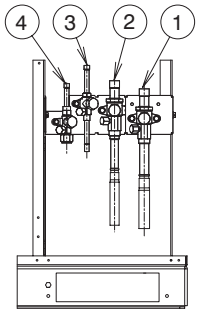
Tubing size (mm)			
Outer dia.	**Thickness**	**Outer dia.**	**Thickness**
ø1/4" (ø6.35)	t1/32" (t0.8)	ø3/4" (ø19.05)	over t5/128" (t1.0)
ø3/8" (ø9.52)	t1/32" (t0.8)	ø7/8" (ø22.22)	t5/128" (t1.0)
ø1/2" (ø12.7)	t1/32" (t0.8)	ø1-1/8" (ø28.58)	t5/128" (t1.0)
ø5/8" (ø15.88)	t5/128" (t1.0)	ø1-3/8" (ø34.92)	over t3/64" (t1.1)

2

4-13. Connect the Tubing

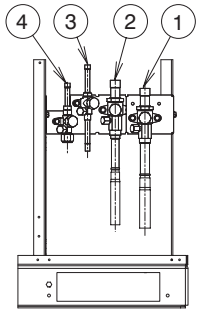
- Use the supplied connector tubing. (See figure below.)

72 type (6-Ton)



	Refrigerant tubing	Connection method	Use supplied connector tube?
①	Suction tube	Brazed connection	No
②	Discharge tube	Brazed connection	No
③	Liquid tube	Brazed connection	No
④	Balance tube	Flared connection	No

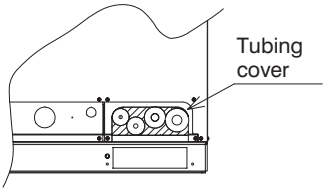
96 type (8-Ton)



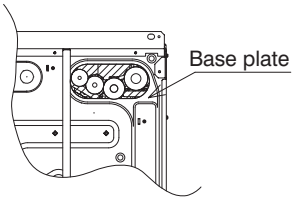
	Refrigerant tubing	Connection method	Use supplied connector tube?
①	Suction tube	Brazed connection	Yes (ø3/4" → ø7/8")
②	Discharge tube	Brazed connection	Yes (ø5/8" → ø3/4")
③	Liquid tube	Brazed connection	No
④	Balance tube	Flared connection	No

Refrigerant tube port

- Use caulking, putty, or a similar material to fill any gaps at the refrigerant tube port (▨) in order to prevent rainwater, dust or foreign substances from entering the unit.
  * Perform this work even if the tubing is routed out in a downward direction.



Tubing routed out forward



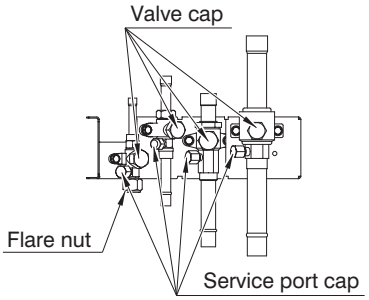
Tubing routed out downward

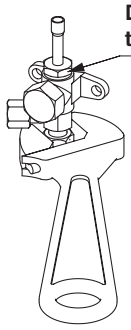
4. Installation Instructions

● Tighten each cap as specified below.

Tightening torque for each cap

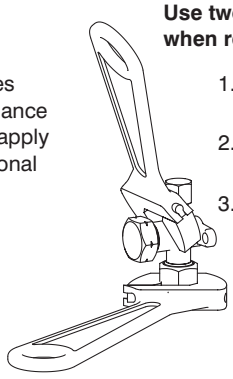
Service port cap (width 19/32")	60 – 100 lbs · in (70 – 120 kgf · cm)
Valve cap (width 55/64")	170 – 220 lbs · in (200 – 250 kgf · cm)
Flare nut (valve dia. ø3/8")	300 – 360 lbs · in (340 – 420 kgf · cm)





Do not apply an adjustable wrench to the hexagonal part.

Do not use two adjustable wrenches when removing or installing the balance tube flare nut. In particular, do not apply an adjustable wrench to the hexagonal part at the top of the valve.
(If force is applied to this part, gas leakage will occur.)



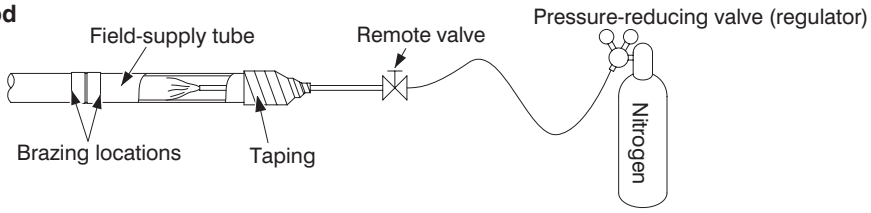
Use two adjustable wrenches, as shown in the figure, when removing the liquid tube valve flare nut.

1. Do not apply a wrench to the valve cap when removing or installing the flare nuts. Doing so may damage the valve.
2. If the valve cap is left off for a long period of time, refrigerant leakage will occur. Therefore, do not leave the valve cap off.
3. Applying refrigerant oil to the flare surface can be effective in preventing gas leakage, however be sure to use a refrigerant oil which is suitable for the refrigerant that is used in the system. (This unit utilizes R410A refrigerant, and the refrigerant oil is ether oil (synthetic oil). However, hub oil (synthetic oil) can also be used.)

2

● Precautions for brazing
Be sure to replace the air inside the tube with nitrogen to prevent oxide film from forming during the brazing process.
Be sure to use a damp cloth or other means to cool the valve unit during brazing.

Work method



CAUTION

1. Be sure to use nitrogen. (Oxygen, CO_2, and CFC must not be used.)
2. Use a pressure-reducing valve on the nitrogen tank.
3. Do not use agents intended to prevent the formation of oxide film. They will adversely affect the refrigeration oil, and may cause equipment failure.
4. The balance tube is not used if only 1 outdoor unit is installed.
   Use the unit in the same conditions as when it was shipped from the factory.

5. HOW TO PROCESS TUBING

The liquid tubing side is connected by a flare nut, and the gas tubing side is connected by brazing.

5-1. Connecting the Refrigerant Tubing

Use of the Flaring Method

Many of conventional split system air conditioners employ the flaring method to connect refrigerant tubes which run between indoor and outdoor units. In this method, the copper tubes are flared at each end and connected with flare nuts.

Flaring Procedure with a Flare Tool

(1) Cut the copper tube to the required length with a tube cutter. It is recommended to cut approx. 1 – 2 ft. longer than the tubing length you estimate.

(2) Remove burrs at the end of the copper tube with a tube reamer or file. This process is important and should be done carefully to make a good flare. (Fig. 2-19)

NOTE

When reaming, hold the tube end downward and be sure that no copper scraps fall into the tube. (Fig. 2-20)

(3) Remove the flare nut from the unit and be sure to mount it on the copper tube.

(4) Make a flare at the end of copper tube with a flare tool. (Fig. 2-21)

NOTE

A good flare should have the following characteristics:

- inside surface is glossy and smooth
- edge is smooth
- tapered sides are of uniform length

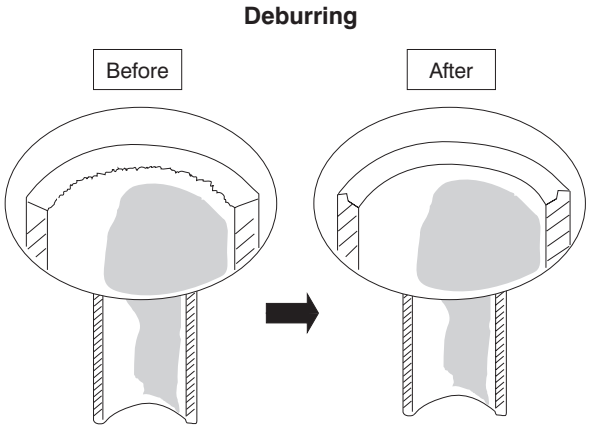


Fig. 2-19

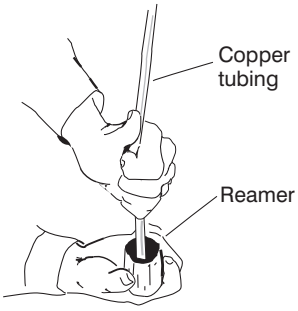


Fig. 2-20

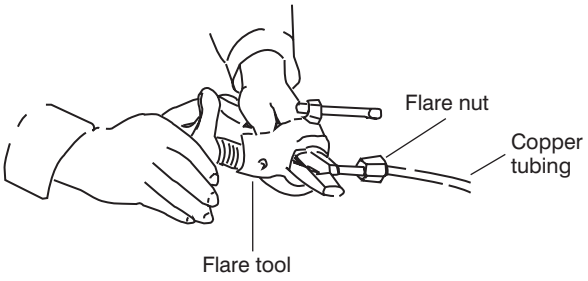


Fig. 2-21

5. HOW TO PROCESS TUBING

Caution Before Connecting Tubes Tightly

(1) Apply a sealing cap or water-proof tape to prevent dust or water from entering the tubes before they are used.

(2) Be sure to apply refrigerant lubricant to the matching surfaces of the flare and union before connecting them together. This is effective for reducing gas leaks. (Fig. 2-22)

(3) For proper connection, align the union tube and flare tube straight with each other, then screw in the flare nut lightly at first to obtain a smooth match. (Fig. 2-23)

- Adjust the shape of the liquid tube using a tube bender at the installation site and connect it to the liquid tubing side valve using a flare.

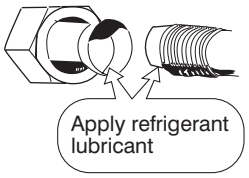


Fig. 2-22

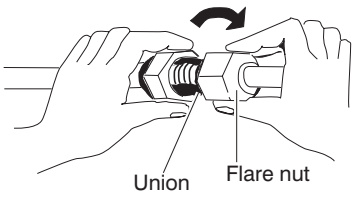


Fig. 2-23

Cautions During Brazing

- **Replace air inside the tube with nitrogen gas to prevent copper oxide film from forming during the brazing process. (Oxygen, carbon dioxide and Freon are not acceptable.)**
- **Do not allow the tubing to get too hot during brazing. The nitrogen gas inside the tubing may overheat, causing refrigerant system valves to become damaged. Therefore allow the tubing to cool when brazing.**
- **Use a reducing valve for the nitrogen cylinder.**
- **Do not use agents intended to prevent the formation of oxide film. These agents adversely affect the refrigerant and refrigerant oil, and may cause damage or malfunctions.**

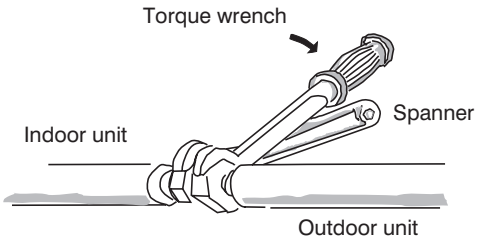


Fig. 2-24

5-2. Connecting Tubing Between Indoor and Outdoor Units

(1) Tightly connect the indoor-side refrigerant tubing extended from the wall with the outdoor-side tubing.

(2) To fasten the flare nuts, apply specified torque as at right:

- When removing the flare nuts from the tubing connections, or when tightening them after connecting the tubing, be sure to use 2 adjustable wrenches or spanners as shown. (Fig. 2-24)
  If the flare nuts are over-tightened, the flare may be damaged, which could result refrigerant leakage and cause in injury or asphyxiation to room occupants.
- For the flare nuts at tubing connections, be sure to use the flare nuts that were supplied with the unit, or else flare nuts for R410A (type 2). The refrigerant tubing that is used must be of the correct wall thickness as shown in the table at right.

Tube diameter	Tightening torque, approximate	Tube thickness
ø1/4" (ø6.35 mm)	120 – 160 lbs·inch (140 – 180 kgf·cm)	1/32" (0.8 mm)
ø3/8" (ø9.52 mm)	300 – 360 lbs·inch (340 – 420 kgf·cm)	1/32" (0.8 mm)
ø1/2"(ø12.7 mm)	430 – 480 lbs·inch (490 – 550 kgf·cm)	1/32" (0.8 mm)
ø5/8" (ø15.88 mm)	590 – 710 lbs·inch (680 – 820 kgf·cm)	5/128" (1.0 mm)
ø3/4" (ø19.05 mm)	870 – 1040 lbs·inch (1000 – 1200 kgf·cm)	over 5/128" (1.0 mm)

Because the pressure is approximately 1.6 times higher than conventional refrigerant pressure, the use of ordinary flare nuts (type 1) or thin-walled tubes may result in tube rupture, injury, or asphyxiation caused by refrigerant leakage.

- In order to prevent damage to the flare caused by over-tightening of the flare nuts, use the table above as a guide when tightening.
- When tightening the flare nut on the liquid tube, use an adjustable wrench with a nominal handle length of 7-7/8 in.

5-3. Insulating the Refrigerant Tubing

Tubing Insulation

- Thermal insulation must be applied to all unit tubing, including the distribution joint (purchased separately). (Fig. 2-25)

  * For gas tubing, the insulation material must be heat resistant to 248°F or above. For other tubing, it must be heat resistant to 176°F or above.

  Insulation material thickness must be 25/64 in. or greater.

  If the conditions inside the ceiling exceed DB 86°F and RH 70%, increase the thickness of the gas tubing insulation material by 1 step.

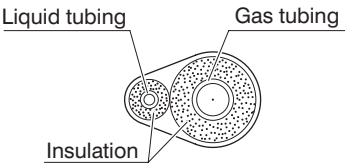
CAUTION

If the exterior of the outdoor unit valves has been finished with a square duct covering, make sure you allow sufficient space to use the valves and to allow the panels to be attached and removed.

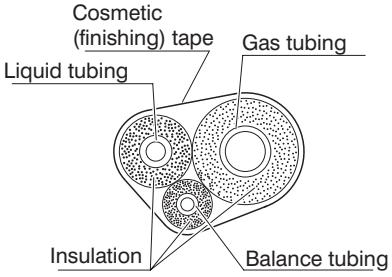
Taping the flare nuts

Wind the white insulation tape around the flare nuts at the gas tube connections. Then cover up the tubing connections with the flare insulator, and fill the gap at the union with the supplied black insulation tape. Finally, fasten the insulator at both ends with the supplied vinyl clamps. (Fig. 2-26)

Two tubes arranged together



Three tubes arranged together



Four tubes arranged together

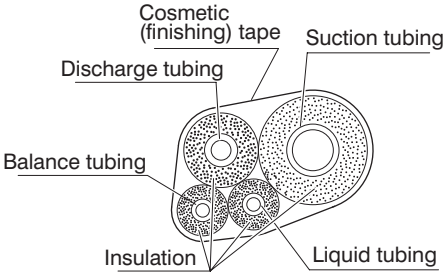


Fig. 2-25

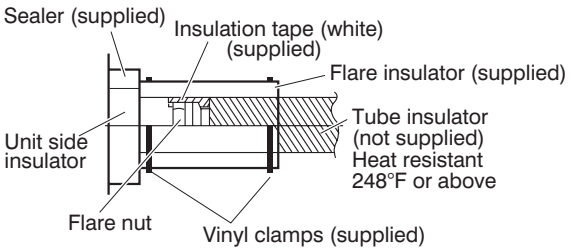


Fig. 2-26

5. HOW TO PROCESS TUBING

5-4. Taping the Tubes

(1) At this time, the refrigerant tubes (and electrical wiring if local codes permit) should be taped together with armoring tape in 1 bundle. To prevent the condensation from overflowing the drain pan, keep the drain hose separate from the refrigerant tubing.
(2) Wrap the armoring tape from the bottom of the outdoor unit to the top of the tubing where it enters the wall. As you wrap the tubing, overlap half of each previous tape turn.
(3) Clamp the tubing bundle to the wall, using 1 clamp approx. each ft. (Fig. 2-27)

NOTE

Do not wind the armoring tape too tightly since this will decrease the heat insulation effect. Also ensure that the condensation drain hose splits away from the bundle and drips clear of the unit and the tubing.

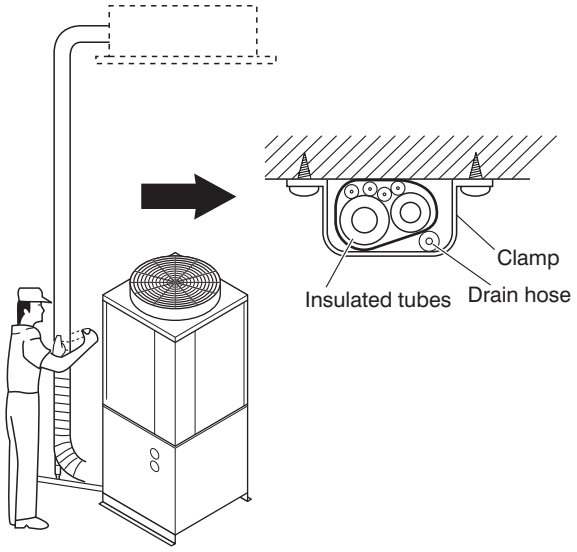


Fig. 2-27

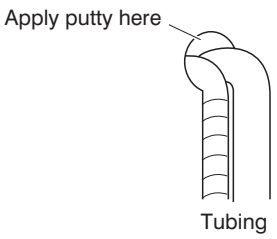


Fig. 2-28

5-5. Finishing the Installation

After finishing insulating and taping over the tubing, use sealing putty to seal off the hole in the wall to prevent rain and draft from entering. (Fig. 2-28)

6. AIR PURGING

Air and moisture in the refrigerant system may have undesirable effects as indicated below.

- pressure in the system rises
- operating current rises
- cooling (or heating) efficiency drops
- moisture in the refrigerant circuit may freeze and block capillary tubing
- water may lead to corrosion of parts in the refrigerant system

Therefore, the indoor unit and tubing between the indoor and outdoor unit must be leak tested and evacuated to remove any noncondensables and moisture from the system.

■ Air Purging with a Vacuum Pump (for Test Run)

Preparation

Check that each tube between the indoor and outdoor units have been properly connected and all wiring for the test run has been completed. Remove the valve caps from all service ports on the outdoor unit. (Fig. 2-30) Note that all service valves on the outdoor unit are kept closed at this stage. The balance tube leak test is not necessary if only 1 outdoor unit is installed.

Leak test

(1) Attach a manifold valve (with pressure gauges) and dry nitrogen gas cylinder to all service ports with charge hoses.
The balance tube leak test is not necessary if only 1 outdoor unit is installed.

CAUTION

Use a manifold valve for air purging. If it is not available, use a stop valve for this purpose. The "Hi" knob of the manifold valve must always be kept closed.

(2) Pressurize the system to no more than 512 psig (36 kgf/cm²G) with dry nitrogen gas and close the cylinder valve when the gauge reading reaches 512 psig (36 kgf/cm²G). Then, test for leaks with liquid soap.

CAUTION

To avoid nitrogen entering the refrigerant system in a liquid state, the top of the cylinder must be higher than the bottom when you pressurize the system. Usually, the cylinder is used in a vertical standing position.

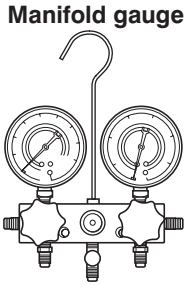


Fig. 2-29a

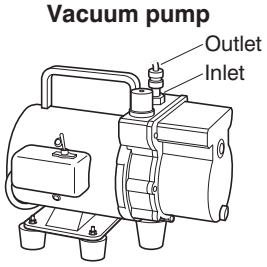


Fig. 2-29b

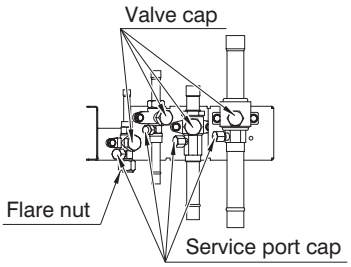


Fig. 2-30

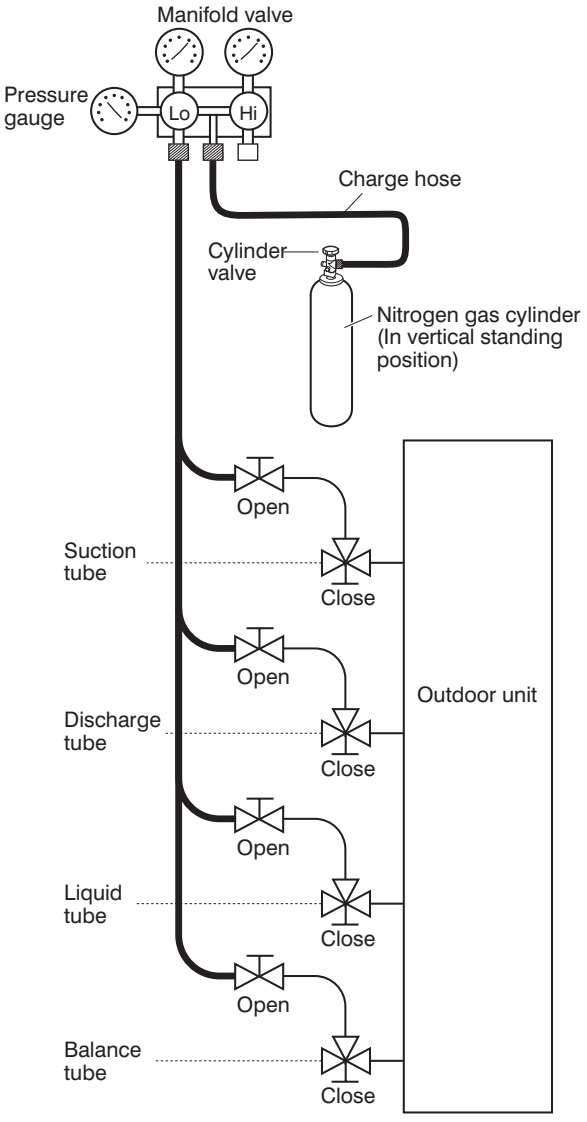


Fig. 2-31

6. AIR PURGING

(3) Do a leak test of all joints of the tubing (both indoor and outdoor) and all service valves. Bubbles indicate a leak. Wipe off the soap with a clean cloth after a leak test.

(4) After the system is found to be free of leaks, relieve the nitrogen pressure by loosening the charge hose connector at the nitrogen cylinder. When the system pressure is reduced to normal, disconnect the hose from the cylinder.

Evacuation

(1) Attach the charge hose end described in the preceding steps to the vacuum pump to evacuate the tubing and indoor unit. Confirm that the “Lo” knob of the manifold valve is open. Then, run the vacuum pump. The operation time for evacuation varies with the tubing length and capacity of the pump. The following table shows the amount of time for evacuation:

Required time for evacuation when 30 gal/h vacuum pump is used	
If tubing length is less than 49 ft.	If tubing length is longer than 49 ft.
45 min. or more	**90 min. or more**

Evacuation is not necessary for the balance tube if only 1 outdoor unit is installed.

NOTE

The required time in the above table is calculated based on the assumption that the ideal (or target) vacuum condition is less than –14.7 psig (–755 mmHg, 5 Torr).

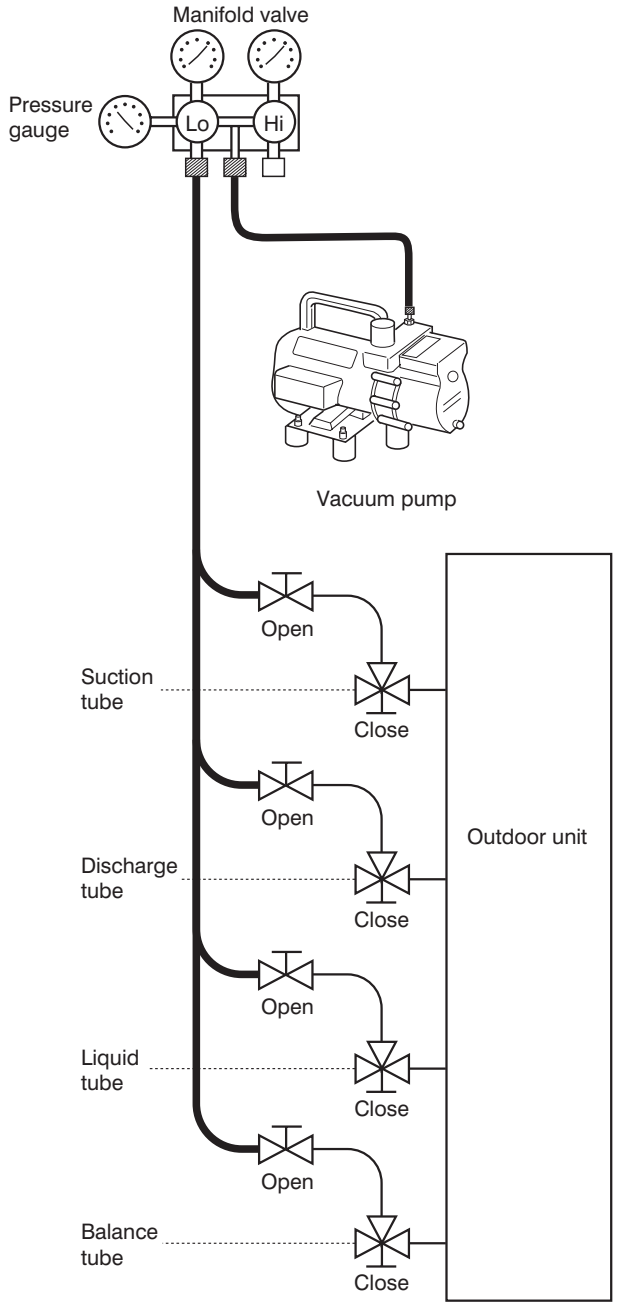


Fig. 2-32

6. AIR PURGING

(2) When the desired vacuum is reached, close the “Lo” knob of the manifold valve and turn off the vacuum pump. Please confirm that the gauge pressure is under –14.7 psig (–755 mmHg, 5 Torr) after 4 to 5 minutes of vacuum pump operation.

Charging additional refrigerant

CAUTION **Use a cylinder designed for use with R410A.**

- Charging additional refrigerant (calculated from the liquid tube length as shown in Section “Additional Refrigerant Charge (page 2-5)”) using the liquid tube service valve. (Fig. 2-33)
- Use a balance or scale to measure the refrigerant accurately.
- If the additional refrigerant charge amount cannot be charged at once, charge the remaining refrigerant in liquid form by using the suction tube service valve with the system in Cooling mode at the time of test run. (Fig. 2-34)
- Close the valve on the cylinder containing R410A.

Finishing the job

(1) With a flathead screwdriver, turn the liquid tube service valve counter-clockwise to fully open the valve.

(2) Turn the all service valve counter-clockwise to fully open the valve.

(3) Close all stop valves and loosen the “Lo” knob of the manifold valve.

(4) Loosen the charge hose connected to all service port, then remove the hose.

(5) Replace all valve caps at all service ports and fasten them securely.

This completes air purging with a vacuum pump.
The air conditioner is now ready for a test run.

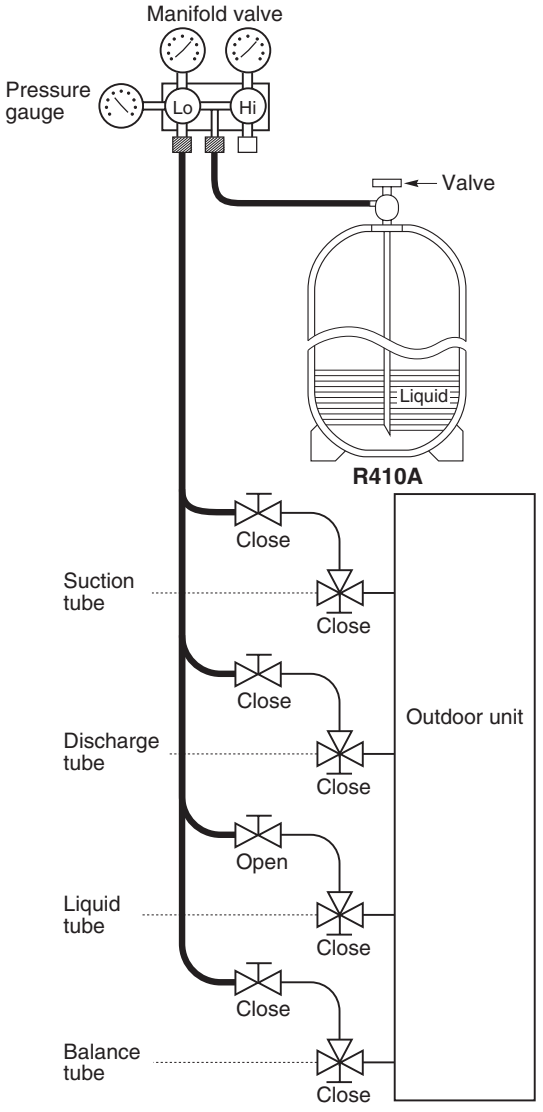


Fig. 2-33

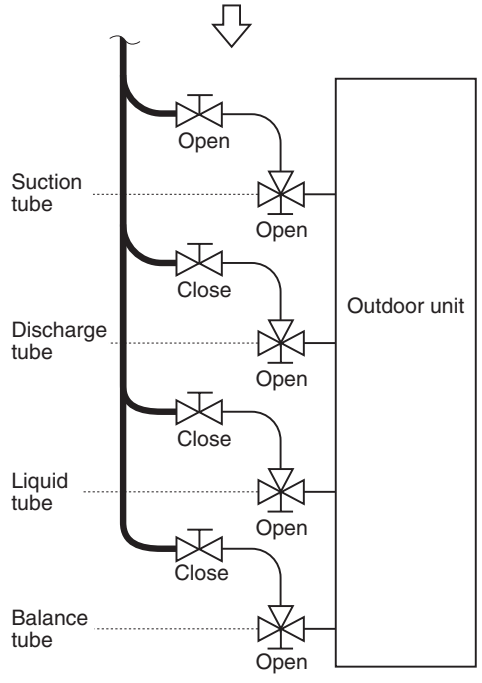


Fig. 2-34

7. Optional Parts

7-1. Distribution Joint Kits

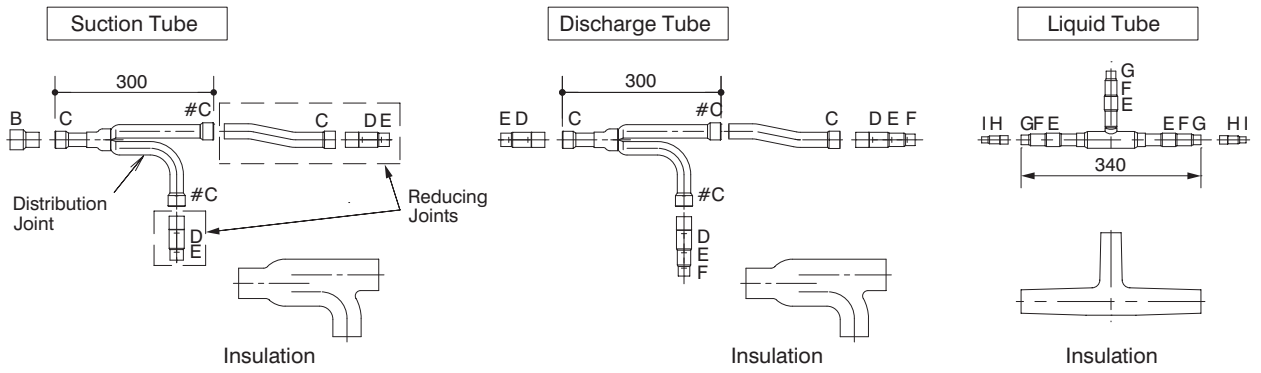
■ CZ-P900PH1U (for R410A)

How to Attach Distribution Joint

1. Accompanying Parts
   Check the contents of your distribution joint kit.

2. Distribution Joint Kits (with insulation)

CZ-P900PH1U	USE:For outdoor unit (Capacity after distribution joint is 90.0kW or less.)



* Insulators for both the Suction tube and the Discharge tube are the same.

* Suction tube and Discharge tube are similar in sizes and both the tube entrances have the same diameter. So the both Distribution joints can fit into different tubes. Since the diameter of the tube ends for both Suction and Discharge tube are different, take care not to connect the distribution joint different.See the "#" marks on the above figures.

- Size of connection point on each part (Shown are inside diameters of tubing)

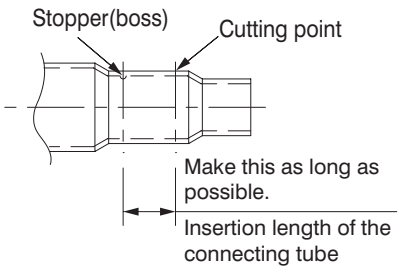
Size	Part B	Part C	Part D	Part E	Part F	Part G	Part H	Part I
mm	Ø34.93	Ø28.58	Ø25.4	Ø22.22	Ø19.05	Ø15.88	Ø12.7	Ø9.52
Inch	1-1/4	1-1/8	1	7/8	3/4	5/8	1/2	3/8

- Using a tube cutter, cut the joints at the diameter required to match the outside diameter of the tubing you are connecting.
  (This is usually done at the installation site.) The tube diameter depends on the total capacity of the outdoor unit. Note that you do not have to cut the joints if it already matches the tubing end size. For size selection of the tube diameter, refer to the installation instructions provided with the outdoor unit.

NOTE

Avoid forceful cutting that may harm the shape of the joints or tubing.
(Inserting the tubing will not be possible if the tube shape is not proper.)

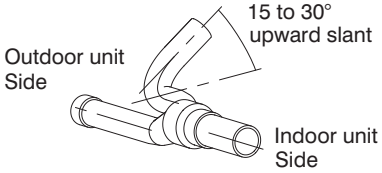
- Cut off as far away from stopper as possible.
- After cutting the joints, be sure to remove burrs on the inside of the joints. (If the joints have been squashed or dented badly, reshaped them using a tube spreader.)
- Make sure there is no dirt or other foreign substances inside the distribution joint.



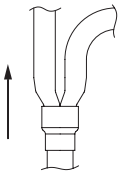
7. Optional Parts

- The distribution joint can be either horizontal or vertical.

  In the case of horizontal, the L-shaped tubing must be slanted slightly upward (15° to 90°).

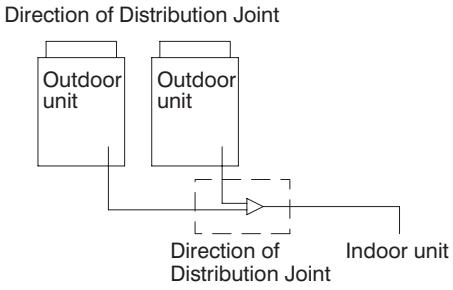


In case of horizontal position



In case of vertical position

(directed upward or downward)



- When brazing, replace air inside the tube with nitrogen gas to prevent copper oxide from forming.
- To insulate the distribution joint, use the supplied tubing insulation.

  (If using insulation other than that supplied, make sure that its heat resistance is 248°F or higher.)
- For additional details, refer to the installation instructions provided with the outdoor unit.

7. Optional Parts

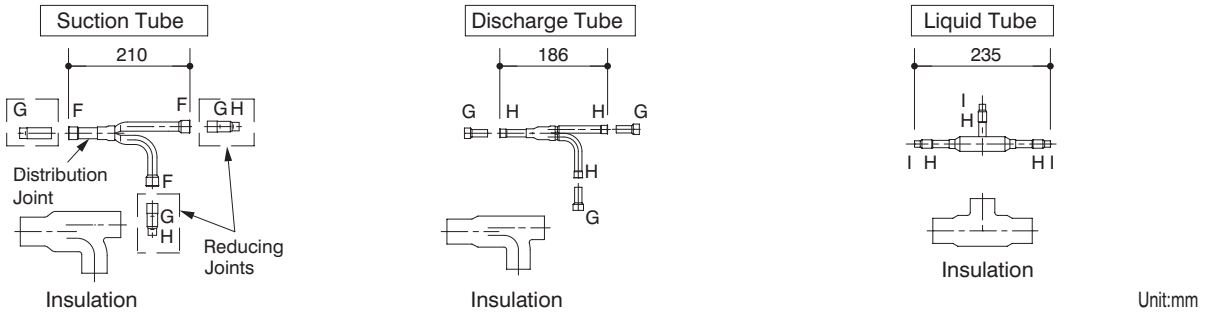
■ CZ-P224BH1U, CZ-P680BH1U, CZ-P1350BH1U (for R410A)

How to Attach Distribution Joint

1. Accompanying Parts
   Check the contents of your distribution joint kit.

2. Distribution Joint Kits (with insulation)

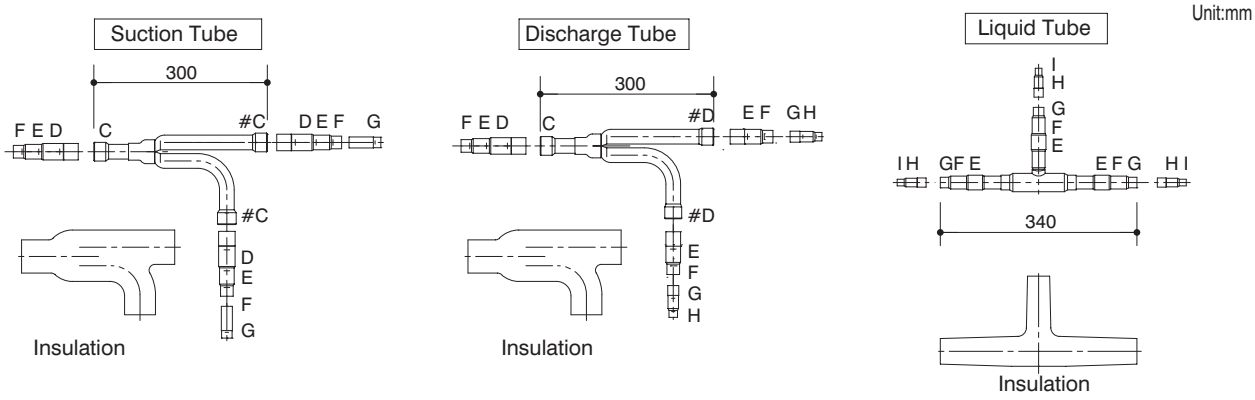
CZ-P224BH1U	USE:For Indoor unit(Capacity after distribution joint is 22.4kW or less.)



Unit:mm

CZ-P680BH1U	USE:For indoor unit(Capacity after distribution joint is greater than 22.4kW and no more than 68.0kW.)

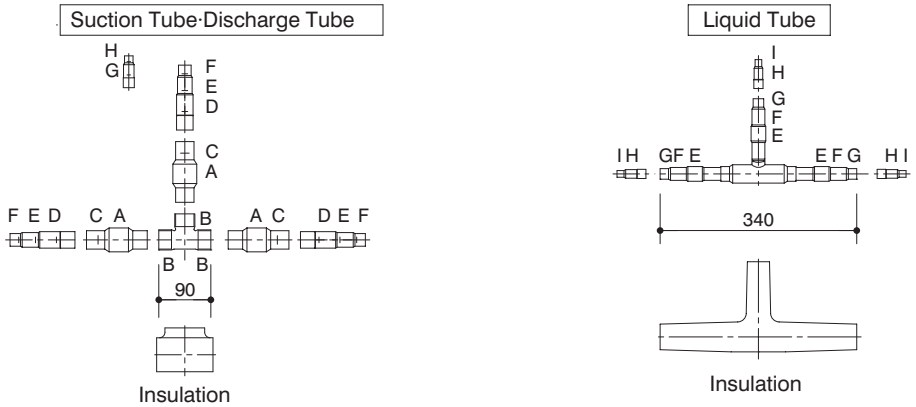
Unit:mm



* Insulators for both the Suction tube and the Discharge tube are the same.

* Suction tube and Discharge tube are similar in sizes and both the tube entrances have the same diameter. So the both Distribution joints can fit into different tubes. Since the diameter of the tube ends for both Suction and Discharge tube are different, take care not to connect the distribution joint different. See the "#" marks on the above figures.

CZ-P1350BH1U	USE:For indoor unit(Capacity after distribution joint is greater than 68.0kW and no more than 135.0kW.)



Unit:mm

7. Optional Parts

- Size of connection point on each part (Shown are inside diameters of tubing)

Size	Part A	Part B	Part C	Part D	Part E	Part F	Part G	Part H	Part I
mm	Ø38.1	Ø34.93	Ø28.58	Ø25.4	Ø22.22	Ø19.05	Ø15.88	Ø12.7	Ø9.52
Inch	1-1/2	1-1/4	1-1/8	1	7/8	3/4	5/8	1/2	3/8

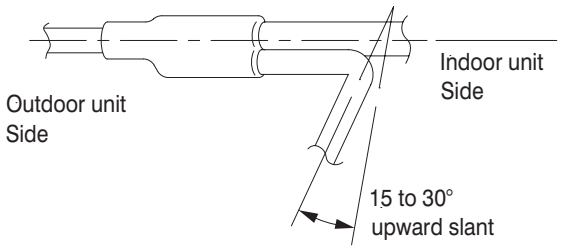
3. Making Branch Connections

- Using a tube cutter,cut the joints at the diameter required to match the outside diameter of the tubing you are connecting.
  (This is usually done at the installation site.) The tube diameter depends on the total capacity of the indoor unit. Note that you do not have to cut the joints if it already matches the tubing end size. For size selection of the tube diameter, refer to the installation instructions provided with the outdoor unit.

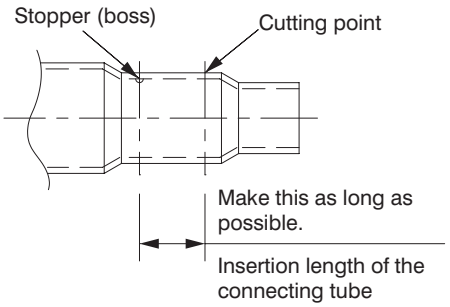
NOTE

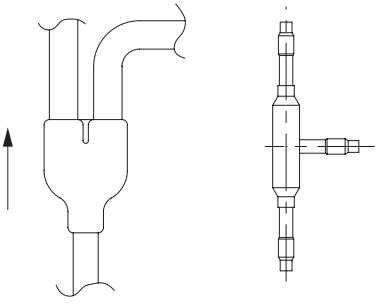
Avoid forceful cutting that may harm the shape of the joints or tubing.
(Inserting the tubing will not be possible if the tube shape is not proper.)

- Cut off as far away from stopper as possible.
- After cutting the joints,be sure to remove burrs on the inside of the joints.
  (If the joints have been squashed or dented badly, reshaped them using a tube spreader.)
- Make sure there is no dirt or other foreign substances inside the distribution joint.
- The distribution joint can be either horizontal or vertical.
  In the case of horizontal, the L-shaped tubing must be slanted slightly upward (15° to 30°).



In case of horizontal position





In case of vertical position
(directed upward or downward)

- When brazing,replace air inside the tube with nitrogen gas to prevent copper oxide from forming.
- To insulate the distribution joint, use the supplied tubing insulation.
  (If using insulation other than that supplied, make sure that its heat resistance is 248˚F or higher.)
- For additional details, refer to the installation instructions provided with the outdoor unit.

7. Optional Parts

7-2. Solenoid Valve Kit for 3WAY VRF System

■ **CZ-P56HR1U, CZ-P160HR1U**

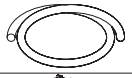
For safety installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.

WARNING This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.

CAUTION This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

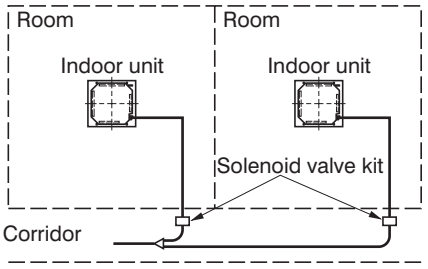
1. Accessories

Part Name	Figure	Q'ty	Remarks
Washer		2	For hanging bolts
Hanging hook		1	Used to hang the Solenoid Valve Kit
M4 screw (L=15/32")		4	For hanging hook
Tapping screw (L=5/16")		4	For Solenoid Valve Relay Kit
Wire holder		1	For Solenoid Valve Relay Kit wiring
3-Way connect wire (6.5ft.)		1	
ACC-3WAY-AAB		1	Solenoid Valve Relay Kit

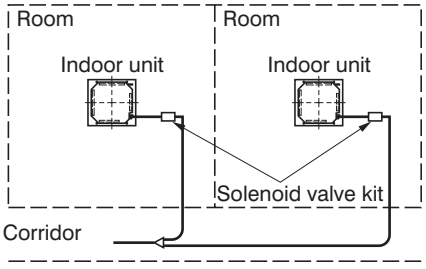
2. Positioning for Installation

- The solenoid valve kit produces some refrigerant noise. If it is to be installed in a quiet place such as a hospital, library or hotel, it is recommended that the solenoid valve kit be installed in the ceiling of a corridor, etc. apart from the room.

Recommended installation

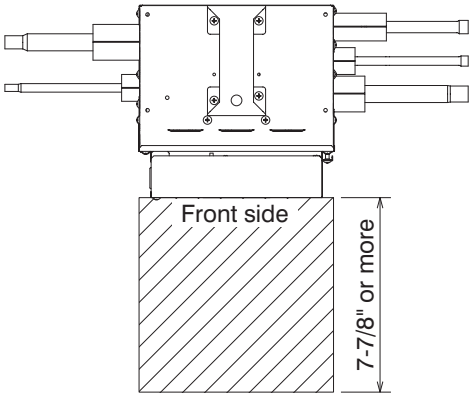


Avoid



7. Optional Parts

- Be sure to secure the solenoid valve kit to the structure and the hanging bolts, etc. using the top or side holes of the hanging hooks. Do not place the solenoid valve kit directly on the ceiling surface. When installing the solenoid valve kit, **remember to install it with the top surface facing upward.** (See the figure shown in the subsection "How to use the fittings" in " 3. Valve Dimensions and Hanging Method.")
- Provide a service space of 7-7/8" or more in front of the installing site.
- **Never conduct drilling or welding on the sheet metal.** Place the solenoid valve kit so that it does not hinder draining.
- Do not cover air holes.

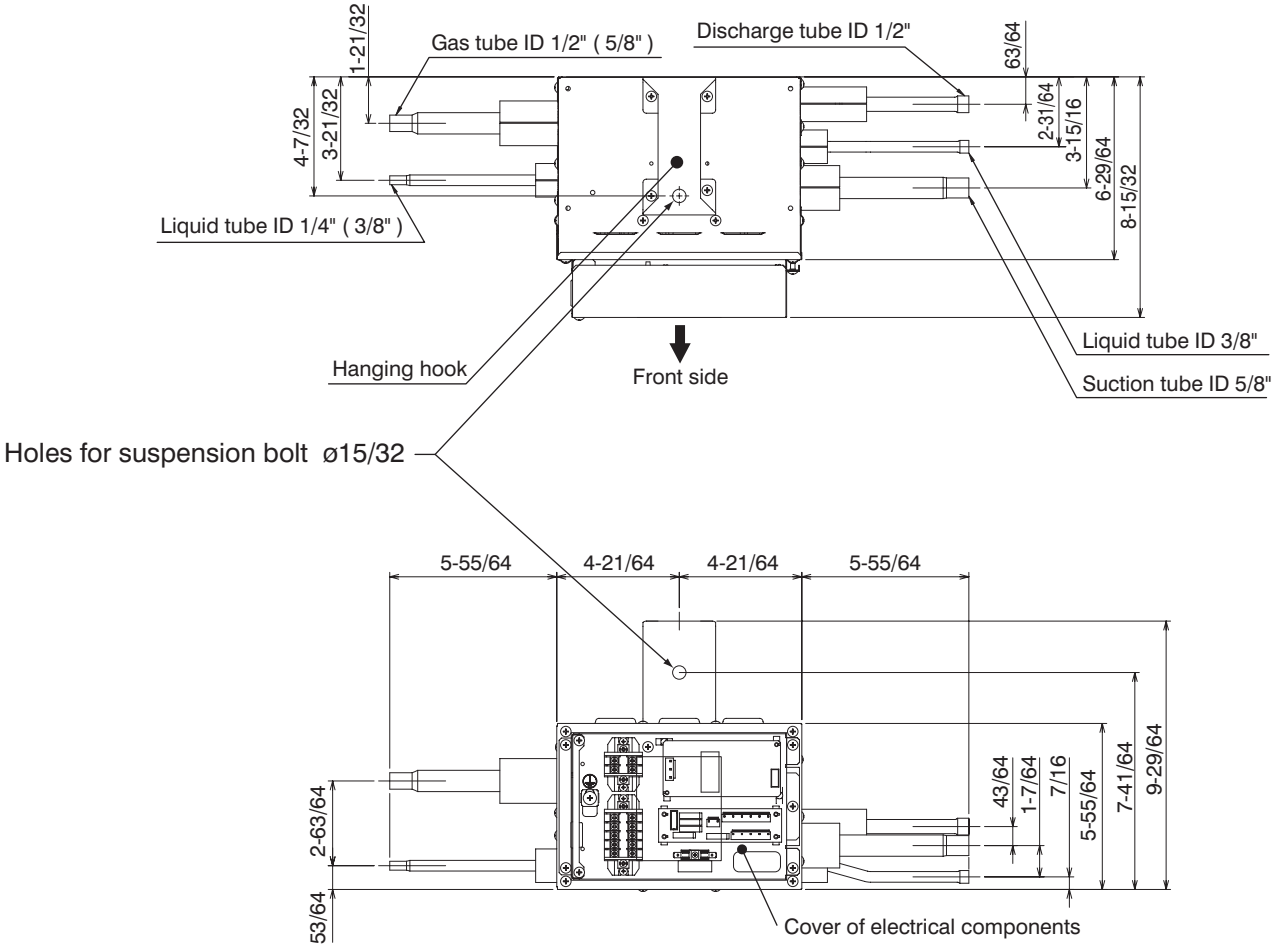


Service space

3. Valve Dimensions and Hanging Method

- There are 2 types of solenoid valve kits: type 56 and type 160. The corresponding indoor unit model capacities are shown in the table at right.

Solenoid Valve Kit	Indoor Unit Capacity
CZ-P56HR1U	7 -18 Type
CZ-P160HR1U	24 - 48 Type

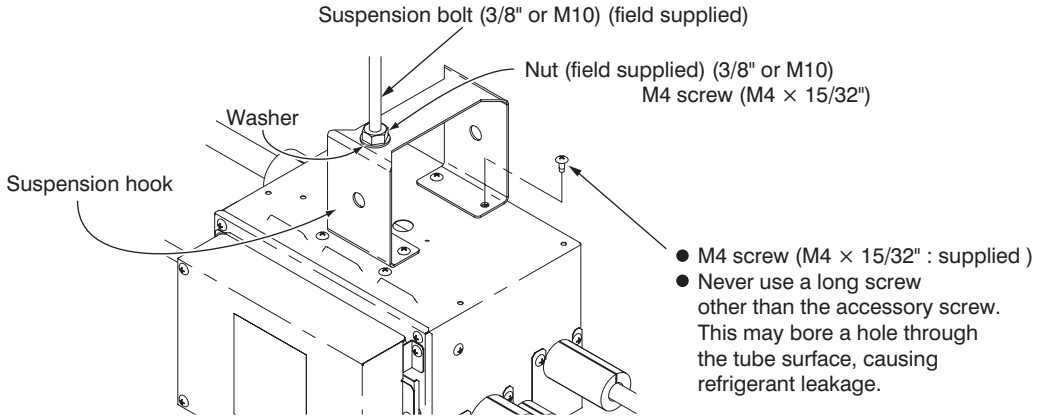


NOTE

unit : in.

This figure shows the unit with suspension fittings attached.

How to use the fittings

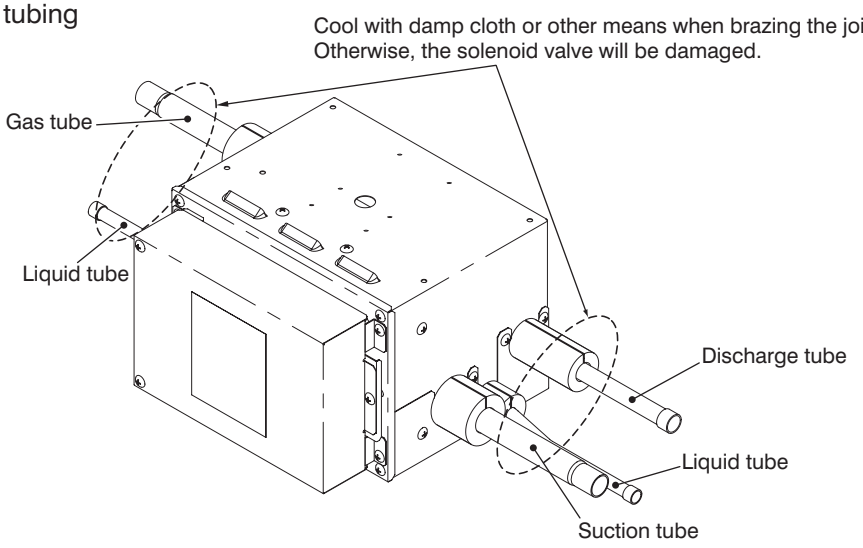

Suspension bolt (3/8" or M10) (field supplied)
Nut (field supplied) (3/8" or M10)
M4 screw (M4 × 15/32")
Washer
Suspension hook
● M4 screw (M4 × 15/32" : supplied)
● Never use a long screw other than the accessory screw. This may bore a hole through the tube surface, causing refrigerant leakage.

Install the hanging hook with supplied 4 screws (M4 X 15/32") taking care of the positioning.

CAUTION Wrong positioning will become unfitted center of gravity position, causing injuries or product damage.

4. Wiring, Tubing, and Heat Insulation

1. Refrigerant tubing


Cool with damp cloth or other means when brazing the joint with a torch.
Otherwise, the solenoid valve will be damaged.
Gas tube
Liquid tube
Discharge tube
Liquid tube
Suction tube

NOTE

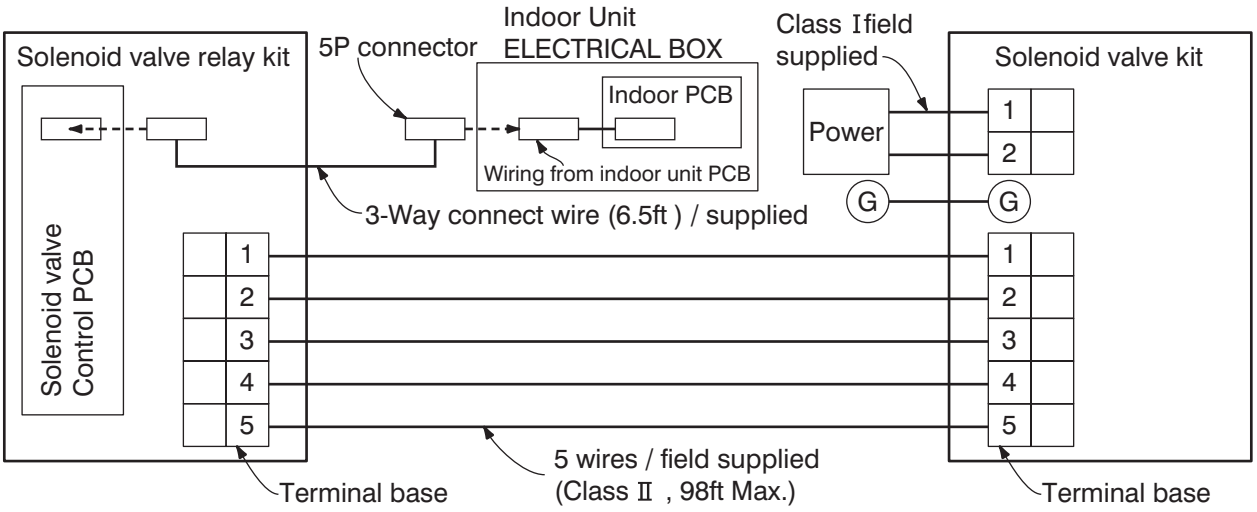
- When brazing, be sure to perform nitrogen replacement inside the tube so that oxidation coating does not form inside the tube. Then stop performing when nitrogen replacement is completed. The solenoid valve, however, will be damaged if nitrogen is applied during while brazing.
- Heat sensitive components, protect from flame and heat conduction.
- Comply with all Local Code Requirements.
- Clean base metals throughly.
- Use proper ventilation to carry fumes away from the work area.
- Use a high quality silver based solder of at least 15% silver.
- Heat the base materials broadly and uniformly.
- Take precautions not to overheat the device which could damage sensitive internal components.
- Insure compliance with all local codes!

2. Heat Insulation

- Be sure to insulate the tubing after finishing leakage inspection.
- Wrap insulators (field supplied) having a thickness of 25/64" or more with the heat resistance of 248 °F or more around the discharge tubes and gas tubes, and 176 °F or more around the suction tubes and liquid tubes.
- Wrap around the each tube not to make gaps between the thermal insulation.
- Failure to conduct shielding gaps and thermal insulation will cause water leakage.

7. Optional Parts

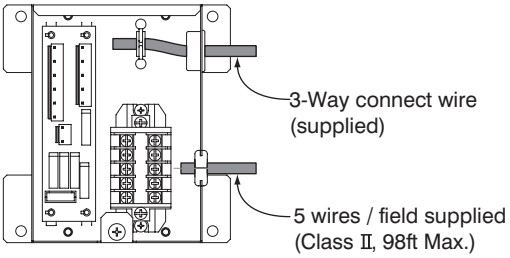
3. Wiring

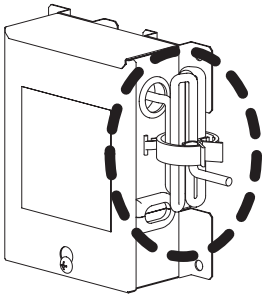


It requires that the Class Ⅰ wire and Class Ⅱ wire should be separated.

4. Procedure :

1. Connect the power supply wire to the solenoid valve kit, using the Class Ⅰ wire.
2. Connect the solenoid valve kit to the solenoid valve relay kit, using the Class Ⅱ wire.
3. Connect the solenoid valve relay kit to the indoor unit, using the supplied connect wire.
4. The left-over wires connected to the solenoid valve relay kit should be tied up in a bundle of wires by the supplied wire holder not to leave the wires loose as shown in the diagram at right.





5. Installation to the Solenoid Valve Relay Kit

Install the solenoid valve relay kit into the indoor unit and fix it using a Philips-head screwdriver. See the diagram in the section of "6. Electrical Wiring Diagrams".

WARNING

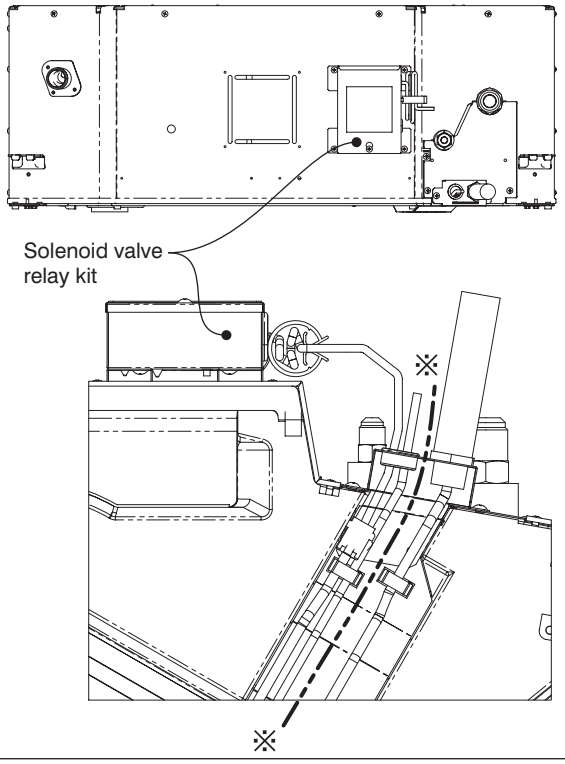
- Do not install outside the building and the area where the water is splashed. Failure to do so could result in product or property damage.
- Do not handle or touch the unit with wet hands. Failure to do so could result in electric shock.

7. Optional Parts

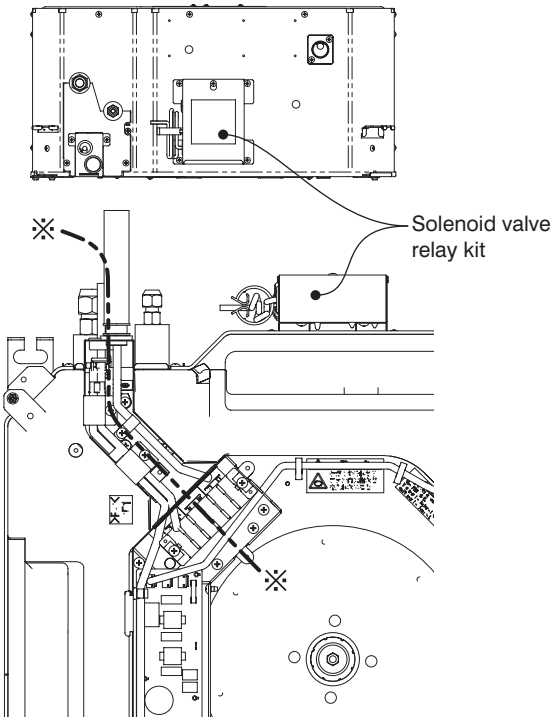
6. Electrical Wiring Diagrams

※ Make sure that the power supply wiring, communication wiring and 3-way wiring will not be crossed each other.

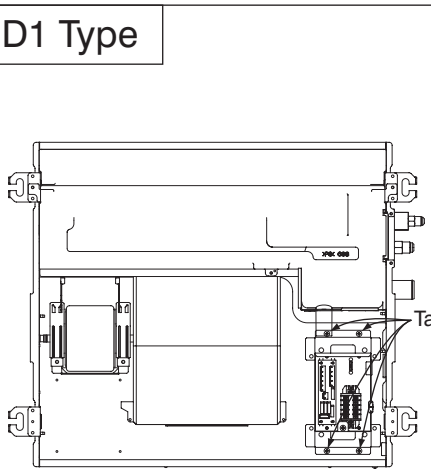
U1 Type

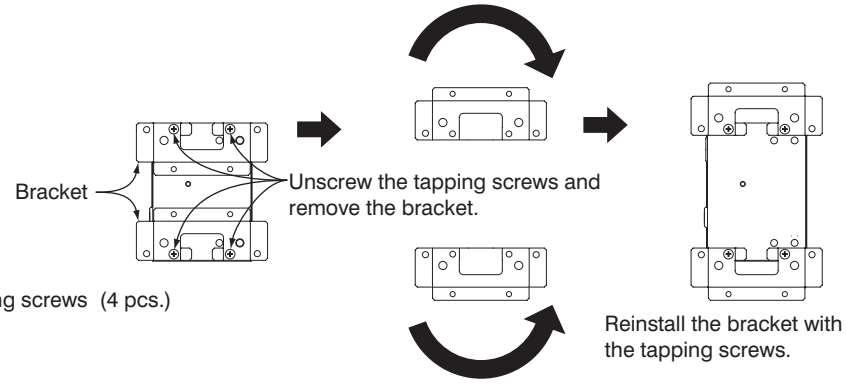


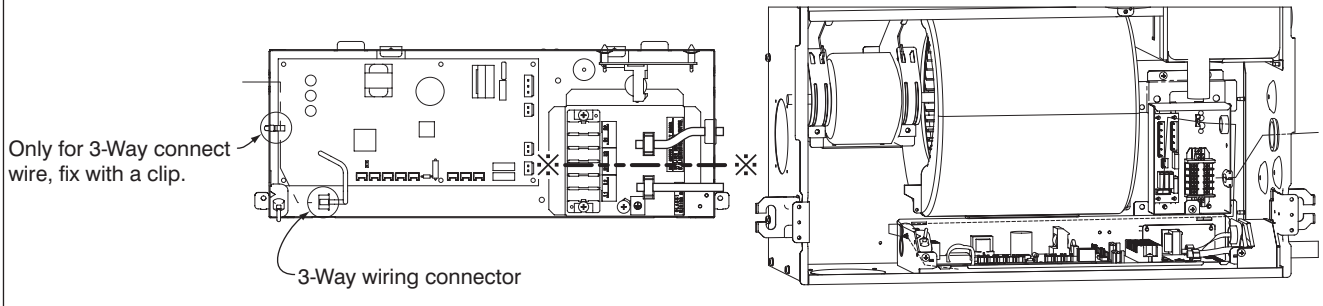
Y1 Type



D1 Type

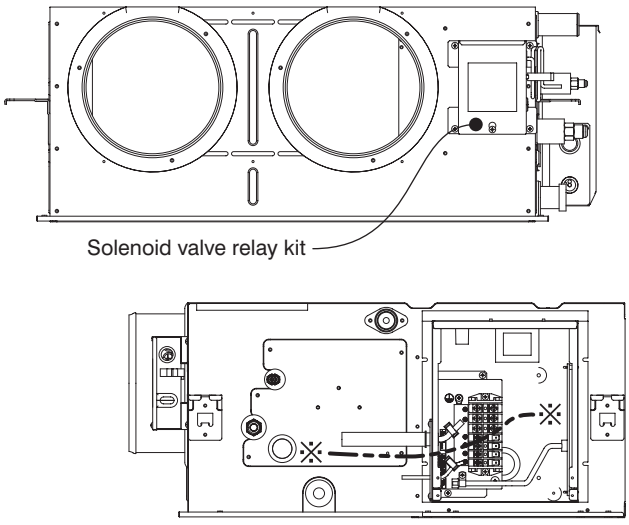




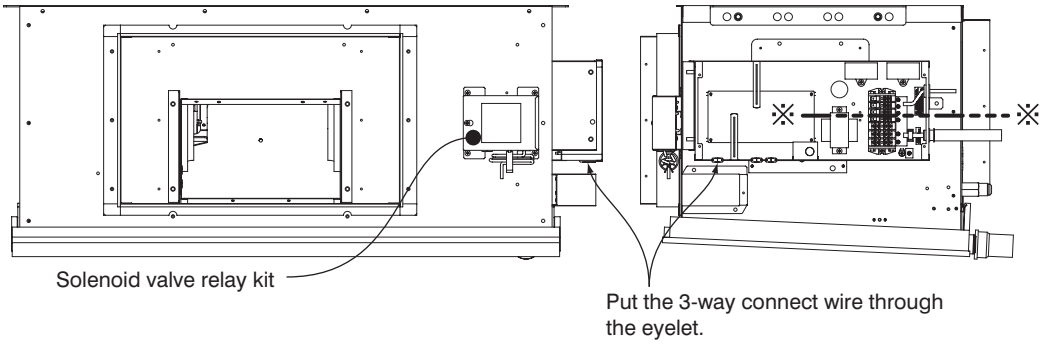


7. Optional Parts

F1 Type



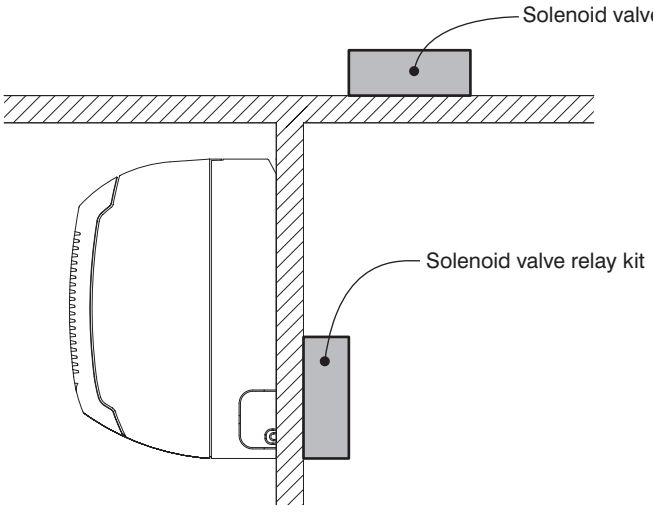
E1 Type



K1 Type

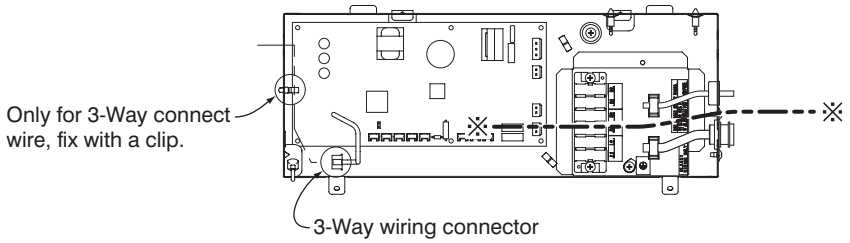
For wall-mount type (K1 type), install the solenoid valve relay kit on the wall.

Important:
Installation behind the wall or ceiling is required that the maintenance should become capable.

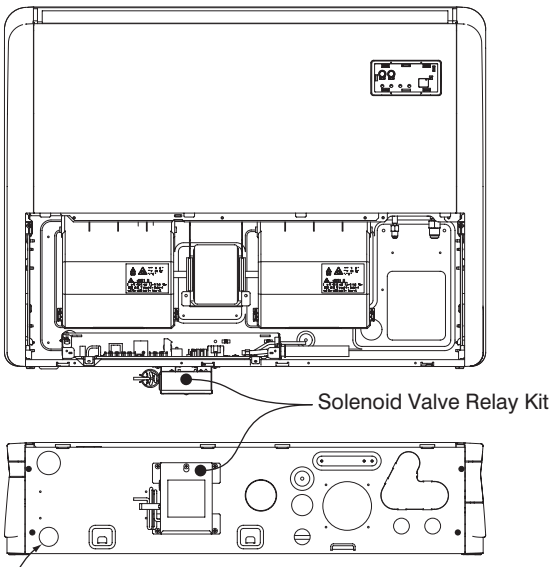


T1 Type

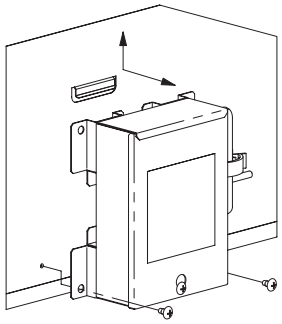
Common use

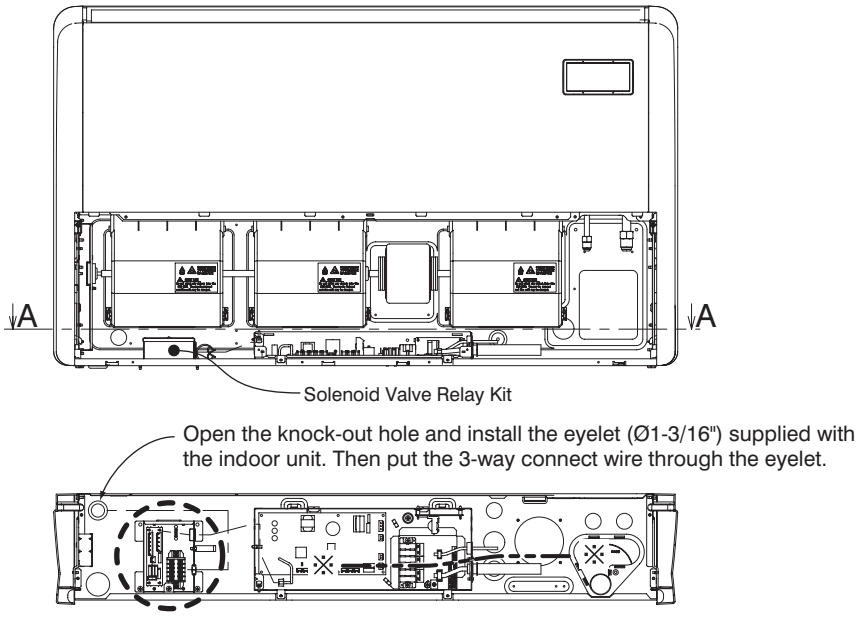


Model : S-12MT1U6/ S-18MT1U6


Solenoid Valve Relay Kit
Open the knock-out hole and install the eyelet (Ø1-3/16") supplied with the indoor unit. Then put the 3-way connect wire through the eyelet.

Model : S-24MT1U6




A
A
Solenoid Valve Relay Kit
Open the knock-out hole and install the eyelet (Ø1-3/16") supplied with the indoor unit. Then put the 3-way connect wire through the eyelet.
※
※

Contents

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3. Timer Remote Controller
4. Simplified Remote Controller
5. System Controller
6. Schedule Timer
7. Intelligent Controller (CZ-256ESMC1U)
8. Communication Adaptor (CZ-CFUNC1U)
9. Remote Sensor
10. LonWorks Interface (CZ-CLNC1U)

* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

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12. Intaking Fresh Air of 4-Way Casstte Type and Slim Low Static Ducted Type
* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

1. Outdoor Unit

1-1. Specifications

Unit Specifications (1)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <6-Ton>		
MODEL No.			U-72MF1U9, U-72MF1U9E*		
SOURCE			208-230V/3N/60Hz		
PERFORMANCE					
Cooling capacity		BTU / h (kW)	72,000 (21.1)		
Heating capacity		BTU / h (kW)	81,000 (23.7)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	35 (890)		
	Depth	in. (mm)	Ceiling dimension : 35 (890)		
Net weight		lbs. (kg)	573 (260)		
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208	230	
Cooling	Running amperes	A	15.1	14.2	
	Power input	kW	5.30	5.30	
	Power factor	%	97.3	93.8	
Heating	Running amperes	A	16.5	15.5	
	Power input	kW	5.79	5.79	
	Power factor	%	97.4	94.0	
Starting amperes		A	3	3	
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1		
Motor output		kW	4.1		
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.40 (5.3 liters)		
Crankcase heater		W	25		
Capacity control		%	10 - 100 %		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)		
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1		
Air circulation		CFM	5,300		
External static pressure		in.WG	0		
Motor output (No. of poles)		kW	0.7/8P		
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø3/4 (ø19.05) *1 (Brazing)		
	Discharge tube	in. (mm)	ø5/8 (ø15.88) (Brazing)		
	Liquid tube	in. (mm)	ø3/8 (ø9.52) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)	Heating: -4 ~ 59 (WB)	
Operation sound (Hi)		dB-A	54.5 (Quiet mode: 51.5)		
Primary accessories			Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)		

* Outdoor unit model name ended with the letter “E”

Refer to the Section 1 “3. Salt-Air Damage Resistant Specifications.”

*1 If the size of tubing (LA) is less than 16.4 feet, it is recommended that the tubing diameter be larger than ø7/8" (ø22.22).

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.

(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)

(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (2)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <8-Ton>		
MODEL No.			U-96MF1U9, U-96MF1U9E*		
SOURCE			208-230V/3N/60Hz		
PERFORMANCE					
Cooling capacity		BTU / h (kW)	96,000 (28.1)		
Heating capacity		BTU / h (kW)	108,000 (31.6)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	35 (890)		
	Depth	in. (mm)	Ceiling dimension : 35 (890)		
Net weight		lbs. (kg)	672 (305)		
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208	230	
Cooling	Running amperes	A	23.2	21.6	
	Power input	kW	7.75	7.75	
	Power factor	%	92.8	90.2	
Heating	Running amperes	A	25.4	23.7	
	Power input	kW	8.60	8.60	
	Power factor	%	94.0	91.2	
Starting amperes		A	140	136	
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1		
Motor output		kW	2.7 + 3.75		
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.96 (7.4 liters)		
Crankcase heater		W	25 + 32		
Capacity control		%	8 - 100 %		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)		
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1		
Air circulation		CFM	5,650		
External static pressure		in.WG	0		
Motor output (No. of poles)		kW	0.7/8P		
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø7/8 (ø22.22) *1 (Brazing)		
	Discharge tube	in. (mm)	ø3/4 (ø19.05) (Brazing)		
	Liquid tube	in. (mm)	ø3/8 (ø9.52) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)	Heating: -4 ~ 59 (WB)	
Operation sound (Hi)		dB-A	55.0 (Quiet mode: 52.0)		
Primary accessories			Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)		

* Outdoor unit model name ended with the letter "E"
Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

*1 If the size of tubing (LA) is less than 16.4 feet, it is recommended that the tubing diameter be larger than ø1-1/8" (ø28.58).

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.
(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)
(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (3)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <12-Ton>		
GENERAL MODEL No.			WU-144MF1U9, WU-144MF1U9E		
COMPONENT OUTDOOR UNIT			U-72MF1U9, U-72MF1U9E*	U-72MF1U9, U-72MF1U9E*	
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	
PERFORMANCE					
Cooling capacity		BTU / h (kW)	144,000 (42.2)		
Heating capacity		BTU / h (kW)	162,000 (47.3)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	74 (1880)		
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)		
Net weight		lbs. (kg)	573 (260)	573 (260)	
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208	230	
Cooling	Running amperes	A	30.2	28.4	
	Power input	kW	10.6	10.6	
	Power factor	%	97.3	93.8	
Heating	Running amperes	A	33.0	30.9	
	Power input	kW	11.6	11.6	
	Power factor	%	97.4	94.0	
Starting amperes		A	20	19	
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1	Inverter driven Rotary type x 1	
Motor output		kW	4.1	4.1	
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.40 (5.3 liters)	1.40 (5.3 liters)	
Crankcase heater		W	25	25	
Capacity control		%	–		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	
Air circulation		CFM	5,300	5,300	
External static pressure		in.WG	0	0	
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)		
	Discharge tube	in. (mm)	ø7/8 (ø22.22) (Brazing)		
	Liquid tube	in. (mm)	ø1/2 (ø12.7) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)	Heating: -4 ~ 59 (WB)	
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)		
Primary accessories			Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)	Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)	

* Outdoor unit model name ended with the letter "E"
Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions
Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.
(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)
(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (4)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <14-Ton>		
GENERAL MODEL No.			WU-168MF1U9, WU-168MF1U9E		
COMPONENT OUTDOOR UNIT			U-72MF1U9, U-72MF1U9E*	U-96MF1U9, U-96MF1U9E*	
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	
PERFORMANCE					
Cooling capacity		BTU / h (kW)	168,000 (49.2)		
Heating capacity		BTU / h (kW)	189,000 (55.4)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	74 (1880)		
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)		
Net weight		lbs. (kg)	573 (260)	672 (305)	
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208	230	
Cooling	Running amperes	A	38.3	35.8	
	Power input	kW	13.1	13.1	
	Power factor	%	94.6	91.6	
Heating	Running amperes	A	41.9	39.1	
	Power input	kW	14.4	14.4	
	Power factor	%	95.4	92.3	
Starting amperes		A	157	152	
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1	Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	
Motor output		kW	4.1	2.7 + 3.75	
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.40 (5.3 liters)	1.96 (7.4 liters)	
Crankcase heater		W	25	25 + 32	
Capacity control		%	–		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	
Air circulation		CFM	5,300	5,650	
External static pressure		in.WG	0	0	
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)		
	Discharge tube	in. (mm)	ø7/8 (ø22.22) (Brazing)		
	Liquid tube	in. (mm)	ø5/8 (ø15.88) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)	Heating: -4 ~ 59 (WB)	
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)		
Primary accessories			Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)	Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	

* Outdoor unit model name ended with the letter "E"

Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.

(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)

(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (5)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <16-Ton>		
GENERAL MODEL No.			WU-192MF1U9, WU-192MF1U9E		
COMPONENT OUTDOOR UNIT			U-96MF1U9, U-96MF1U9E*	U-96MF1U9, U-96MF1U9E*	
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	
PERFORMANCE					
Cooling capacity		BTU / h (kW)	192,000 (56.3)		
Heating capacity		BTU / h (kW)	216,000 (63.3)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	74 (1880)		
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)		
Net weight		lbs. (kg)	672 (305)	672 (305)	
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208	230	
Cooling	Running amperes	A	46.3	43.2	
	Power input	kW	15.5	15.5	
	Power factor	%	92.8	90.2	
Heating	Running amperes	A	50.8	47.3	
	Power input	kW	17.2	17.2	
	Power factor	%	94.0	91.2	
Starting amperes		A	165	160	
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	
Motor output		kW	2.7 + 3.75	2.7 + 3.75	
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.96 (7.4 liters)	1.96 (7.4 liters)	
Crankcase heater		W	25 + 32	25 + 32	
Capacity control		%	–		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	
Air circulation		CFM	5,650	5,650	
External static pressure		in.WG	0	0	
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)		
	Discharge tube	in. (mm)	ø7/8 (ø22.22) (Brazing)		
	Liquid tube	in. (mm)	ø5/8 (ø15.88) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)	Heating: -4 ~ 59 (WB)	
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)		
Primary accessories			Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	

* Outdoor unit model name ended with the letter "E"

Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.

(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)

(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (6)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <18-Ton>			
GENERAL MODEL No.			WU-216MF1U9, WU-216MF1U9E			
COMPONENT OUTDOOR UNIT			U-72MF1U9(E*)	U-72MF1U9(E*)	U-72MF1U9(E*)	
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	208-230V/3N/60Hz	
PERFORMANCE						
Cooling capacity		BTU / h (kW)	216,000 (63.3)			
Heating capacity		BTU / h (kW)	243,000 (71.1)			
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (1887)			
	Width	in. (mm)	113 (2870)			
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)			
Net weight		lbs. (kg)	573 (260)	573 (260)	573 (260)	
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)			
ELECTRICAL RATINGS						
Voltage rating		V	208		230	
Cooling	Running amperes	A	45.4		42.5	
	Power input	kW	15.9		15.9	
	Power factor	%	97.3		93.8	
Heating	Running amperes	A	49.5		46.4	
	Power input	kW	17.4		17.4	
	Power factor	%	97.4		94.0	
Starting amperes		A	36		34	
COMPRESSOR						
Type - Q'ty			Inverter driven Rotary type x 1	Inverter driven Rotary type x 1	Inverter driven Rotary type x 1	
Motor output		kW	4.1	4.1	4.1	
Refrigeration oil	Type		FV68S (Ether oil)			
	Charge amount	gal	1.40 (5.3 liters)	1.40 (5.3 liters)	1.40 (5.3 liters)	
Crankcase heater		W	25	25	25	
Capacity control		%	–			
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	
Refrigerant control			Electronic expansion valve			
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost			
Heat exchanger			Aluminum plate fin / Copper tube			
FAN DEVICE						
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	Propeller fan x 1	
Air circulation		CFM	5,300	5,300	5,300	
External static pressure		in.WG	0	0	0	
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	0.7/8P	
Protective devices			High pressure switch, overcurrent (CT method)			
TUBING						
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/4 (ø31.75) (Brazing)			
	Discharge tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)			
	Liquid tube	in. (mm)	ø5/8 (ø15.88) (Brazing)			
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)			
Drain port			–			
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB) Heating: -4 ~ 59 (WB)			
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)			
Primary accessories			Connection tubing ø7/8 (ø22.22) – ø3/4 (ø19.05)	Connection tubing ø7/8 (ø22.22) – ø3/4 (ø19.05)	Connection tubing ø7/8 (ø22.22) – ø3/4 (ø19.05)	

* Outdoor unit model name ended with the letter "E"
Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.
(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)
(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (7)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <20-Ton>		
GENERAL MODEL No.			WU-240MF1U9, WU-240MF1U9E		
COMPONENT OUTDOOR UNIT			U-96MF1U9(E*)	U-72MF1U9(E*)	U-72MF1U9(E*)
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	208-230V/3N/60Hz
PERFORMANCE					
Cooling capacity		BTU / h (kW)	240,000 (70.3)		
Heating capacity		BTU / h (kW)	270,000 (79.1)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	113 (2870)		
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)		
Net weight		lbs. (kg)	672 (305)	573 (260)	573 (260)
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208		230
Cooling	Running amperes	A	53.4		49.9
	Power input	kW	18.4		18.4
	Power factor	%	95.4		92.2
Heating	Running amperes	A	58.4		54.6
	Power input	kW	20.2		20.2
	Power factor	%	95.9		92.8
Starting amperes		A	173		167
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	Inverter driven Rotary type x 1	Inverter driven Rotary type x 1
Motor output		kW	2.7 + 3.75	4.1	4.1
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.96 (7.4 liters)	1.40 (5.3 liters)	1.40 (5.3 liters)
Crankcase heater		W	25 + 32	25	25
Capacity control		%	–		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	Propeller fan x 1
Air circulation		CFM	5,650	5,300	5,300
External static pressure		in.WG	0	0	0
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	0.7/8P
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/4 (ø31.75) (Brazing)		
	Discharge tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)		
	Liquid tube	in. (mm)	ø3/4 (ø19.05) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)		Heating: -4 ~ 59 (WB)
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)		
Primary accessories			Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)	Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)

* Outdoor unit model name ended with the letter "E"

Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.

(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)

(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (8)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <22-Ton>		
GENERAL MODEL No.			WU-264MF1U9, WU-264MF1U9E		
COMPONENT OUTDOOR UNIT			U-96MF1U9(E*)	U-96MF1U9(E*)	U-72MF1U9(E*)
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	208-230V/3N/60Hz
PERFORMANCE					
Cooling capacity		BTU / h (kW)	264,000 (77.4)		
Heating capacity		BTU / h (kW)	297,000 (87.0)		
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)		
	Width	in. (mm)	113 (2870)		
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)		
Net weight		lbs. (kg)	672 (305)	672 (305)	573 (260)
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)		
ELECTRICAL RATINGS					
Voltage rating		V	208		230
Cooling	Running amperes	A	61.5		57.3
	Power input	kW	20.8		20.8
	Power factor	%	93.9		91.1
Heating	Running amperes	A	67.3		62.8
	Power input	kW	23.0		23.0
	Power factor	%	94.9		91.9
Starting amperes		A	182		175
COMPRESSOR					
Type - Q'ty			Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	Inverter driven Rotary type x 1
Motor output		kW	2.7 + 3.75	2.7 + 3.75	4.1
Refrigeration oil	Type		FV68S (Ether oil)		
	Charge amount	gal	1.96 (7.4 liters)	1.96 (7.4 liters)	1.40 (5.3 liters)
Crankcase heater		W	25 + 32	25 + 32	25
Capacity control		%	–		
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)
Refrigerant control			Electronic expansion valve		
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost		
Heat exchanger			Aluminum plate fin / Copper tube		
FAN DEVICE					
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	Propeller fan x 1
Air circulation		CFM	5,650	5,650	5,300
External static pressure		in.WG	0	0	0
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	0.7/8P
Protective devices			High pressure switch, overcurrent (CT method)		
TUBING					
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/4 (ø31.75) (Brazing)		
	Discharge tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)		
	Liquid tube	in. (mm)	ø3/4 (ø19.05) (Brazing)		
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)		
Drain port			–		
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB)	Heating: -4 ~ 59 (WB)	
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)		
Primary accessories			Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	Connection tubing ø7/8 (ø22.22) - ø3/4 (ø19.05)

* Outdoor unit model name ended with the letter "E"

Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.

(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)

(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

Unit Specifications (9)

MODEL NAME			3WAY SYSTEM Capacity Control Outdoor Unit <24-Ton>			
GENERAL MODEL No.			WU-288MF1U9, WU-288MF1U9E			
COMPONENT OUTDOOR UNIT			U-96MF1U9(E*)	U-96MF1U9(E*)	U-96MF1U9(E*)	
SOURCE			208-230V/3N/60Hz	208-230V/3N/60Hz	208-230V/3N/60Hz	
PERFORMANCE						
Cooling capacity		BTU / h (kW)	288,000 (84.4)			
Heating capacity		BTU / h (kW)	324,000 (94.9)			
UNIT DIMENSIONS	Height	in. (mm)	82-9/16 (2097)			
	Width	in. (mm)	113 (2870)			
	Depth	in. (mm)	Ceiling dimension : 35 ~ +2-3/8 (890 ~ +60)			
Net weight		lbs. (kg)	672 (305)	672 (305)	672 (305)	
Color (Munsell code)			Silky shade (1Y 8.5 / 0.5)			
ELECTRICAL RATINGS						
Voltage rating		V	208		230	
Cooling	Running amperes	A	69.5		64.7	
	Power input	kW	23.3		23.3	
	Power factor	%	92.8		90.2	
Heating	Running amperes	A	76.2		71.0	
	Power input	kW	25.8		25.8	
	Power factor	%	94.0		91.2	
Starting amperes		A	191		183	
COMPRESSOR						
Type - Q'ty			Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	Inverter driven Rotary type x 1 + Fixed Speed Scroll type x 1	
Motor output		kW	2.7 + 3.75	2.7 + 3.75	2.7 + 3.75	
Refrigeration oil	Type		FV68S (Ether oil)			
	Charge amount	gal	1.96 (7.4 liters)	1.96 (7.4 liters)	1.96 (7.4 liters)	
Crankcase heater		W	25 + 32	25 + 32	25 + 32	
Capacity control		%	–			
Refrigerant amount at shipment		lbs. (kg)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	R410A - 25.9 (11.8)	
Refrigerant control			Electronic expansion valve			
Defrost method			Reverse-cycle defrost, outdoor unit cycle defrost			
Heat exchanger			Aluminum plate fin / Copper tube			
FAN DEVICE						
Type - Q'ty			Propeller fan x 1	Propeller fan x 1	Propeller fan x 1	
Air circulation		CFM	5,650	5,650	5,650	
External static pressure		in.WG	0	0	0	
Motor output (No. of poles)		kW	0.7/8P	0.7/8P	0.7/8P	
Protective devices			High pressure switch, overcurrent (CT method)			
TUBING						
Refrigerant tubing	Suction tube	in. (mm)	ø1-1/4 (ø31.75) (Brazing)			
	Discharge tube	in. (mm)	ø1-1/8 (ø28.58) (Brazing)			
	Liquid tube	in. (mm)	ø3/4 (ø19.05) (Brazing)			
	Balance tube	in. (mm)	ø3/8 (ø9.52) (Flare nut)			
Drain port			–			
External air temperature operation range		°F	Cooling: 14 ~ 113 °F (DB) Heating: -4 ~ 59 (WB)			
Operation sound (Hi)		dB-A	58.0 (Quiet mode: 55.0)			
Primary accessories			Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	Connection tubing ø1-1/8 (ø28.58) - ø3/4 (ø19.05) ø7/8 (ø22.22) - ø3/4 (ø19.05) ø3/4 (ø19.05) - ø5/8 (ø15.88)	

* Outdoor unit model name ended with the letter "E"

Refer to the Section 1 "3. Salt-Air Damage Resistant Specifications."

Rated conditions

Performance, electrical characteristics values and operating sound are based on JIS B8616 package A/C.

(Cooling : Indoor intake air temperature 80°F DB / 67°F WB. Outdoor intake air temperature 95°F DB.)

(Heating : Indoor intake air temperature 70°F DB. Outdoor intake air temperature 47°F DB / 43°F WB.)

1-2. AHRI Registration Values

Outdoor Unit Models	Indoor Unit Types	Cooling Capacity BTU/h	EER 95°F	IEER	HI Heating Capacity BTU/h	HI COP 47°F	Low Heating Capacity BTU/h	Low COP 17°F	SCHE
U-72MF1U9(E)	Ducted	72,000	11.4	16.4	81,000	3.50	47,000	2.28	24.0
	Non Ducted	69,500	10.9	17.1	77,500	3.31	42,000	2.25	24.7
	Mixed Non-Ducted and Duced	70,500	11.2	16.8	79,000	3.41	44,500	2.27	24.4
U-96MF1U9(E)	Ducted	95,000	11.0	16.0	106,500	3.30	69,000	2.25	23.1
	Non Ducted	93,000	10.9	16.7	103,000	3.31	58,500	2.25	23.5
	Mixed Non-Ducted and Duced	94,000	11.0	16.4	104,500	3.31	63,500	2.25	23.3
WU-144MF1U9(E)	Ducted	139,000	10.8	16.4	157,000	3.21	93,500	2.05	23.1
	Non Ducted	137,000	10.9	17.1	151,000	3.31	83,500	2.25	23.8
	Mixed Non-Ducted and Duced	138,000	10.9	16.8	154,000	3.26	88,500	2.15	23.5
WU-168MF1U9(E)	Ducted	164,000	10.7	16.1	184,000	3.21	114,000	2.05	22.6
	Non Ducted	160,000	10.5	16.9	178,500	3.21	98,000	2.05	23.3
	Mixed Non-Ducted and Duced	162,000	10.6	16.5	181,000	3.21	106,000	2.05	23.0
WU-192MF1U9(E)	Ducted	192,000	10.6	16.0	213,000	3.21	132,000	2.05	22.3
	Non Ducted	186,000	10.5	16.7	206,000	3.21	114,000	2.05	22.8
	Mixed Non-Ducted and Duced	189,000	10.6	16.4	209,500	3.21	123,000	2.05	22.6
WU-216MF1U9(E)	Ducted	203,000	10.6	16.0	228,000	3.21	136,000	2.05	22.2
	Non Ducted	198,000	10.5	16.6	221,000	3.21	120,000	2.05	22.9
	Mixed Non-Ducted and Duced	200,500	10.6	16.3	224,500	3.21	128,000	2.05	22.6
WU-240MF1U9(E)	Ducted	230,000	10.5	16.0	265,000	3.21	159,000	2.05	22.0
	Non Ducted	221,000	10.5	16.4	246,000	3.21	136,000	2.05	22.4
	Mixed Non-Ducted and Duced	225,500	10.5	16.2	255,500	3.21	147,500	2.05	22.2
WU-264MF1U9(E)	Ducted	258,000	9.7	15.9	288,000	3.21	177,000	2.05	21.6
	Non Ducted	252,000	9.4	16.3	269,000	3.21	150,000	2.05	22.0
	Mixed Non-Ducted and Duced	255,000	9.6	16.1	278,500	3.21	163,500	2.05	21.8
WU-288MF1U9(E)	Ducted	281,000	9.6	15.8	312,000	3.21	194,000	2.05	21.2
	Non Ducted	275,000	9.4	16.2	293,000	3.21	165,000	2.05	21.6
	Mixed Non-Ducted and Duced	278,000	9.5	16.0	302,500	3.21	179,500	2.05	21.4

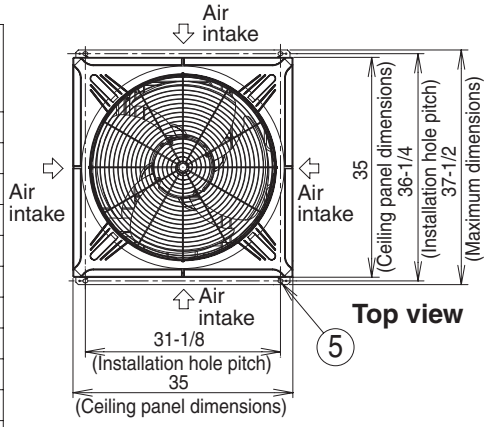
1-3. Dimensional Data

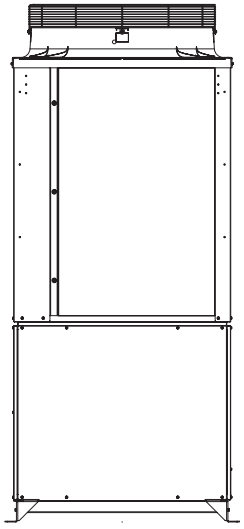
U-72MF1U9, U-72MF1U9E, U-96MF1U9, U-96MF1U9E

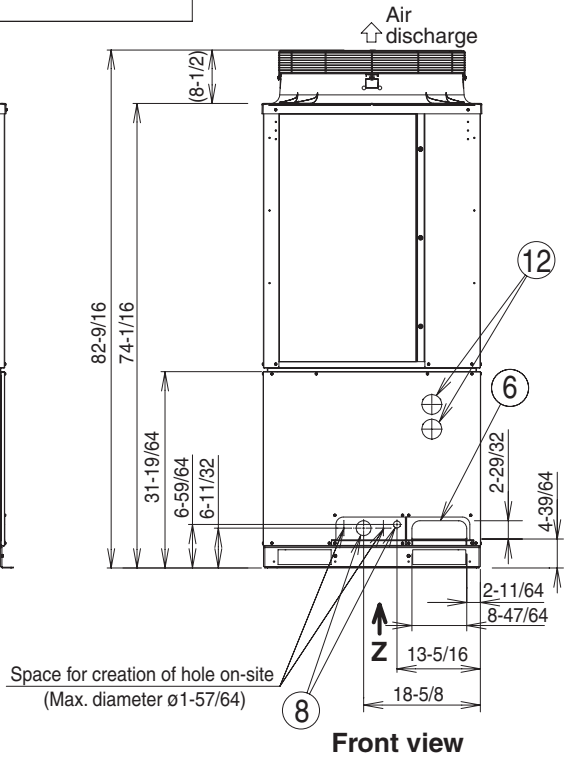
unit : in.(mm)

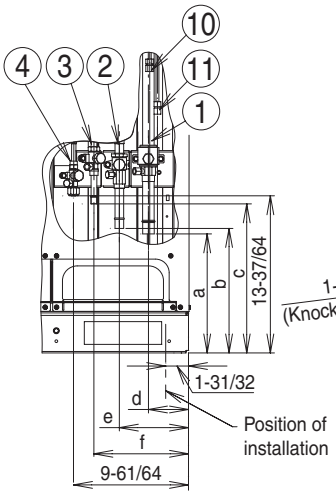
			U-72MF1U9 U-72MF1U9E (6-Ton)	U-96MF1U9 U-96MF1U9E (8-Ton)
①	Refrigerant tube (gas tube)	brazed connection	3/4" (ø19.05)	7/8" (ø22.22)
②	Refrigerant tube (discharge tube)	brazed connection	5/8" (ø15.88)	3/4" (ø19.05)
③	Refrigerant tube (liquid tube)	brazed connection	3/8" (ø9.52)	3/8" (ø9.52)
④	Refrigerant tube (balance tube)	flared connection	3/8" (ø9.52)	3/8" (ø9.52)
⑤	Installation holes (4 –19/32" × 25/32" elongated holes), anchor bolts M12 or 15/32" or larger			
⑥	Refrigerant port (front: knock-out hole and slit)			
⑦	Refrigerant port (bottom: slit hole)			
⑧	Electrical wiring port (front: ø2-23/64", ø1-7/64" knock-out holes – for conduit connection)			
⑨	Electrical wiring port (bottom:ø2-23/64", ø1-1/2" knock-out holes – for conduit connection)			
⑩	Pressure outlet port (for high pressure: ø5/16" (ø7.94) Schrader-type connection)			
⑪	Pressure outlet port (for low pressure: ø5/16" (ø7.94) Schrader-type connection)			
⑫	Knock-out hole for connecting pressure gauge (optional)			

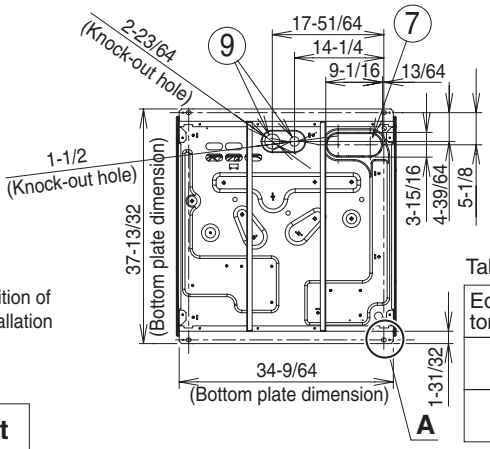
unit : in.

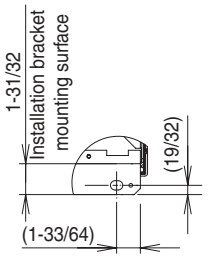












Position of refrigerant connection

Table of Measurements for Refrigerant Tube Connection

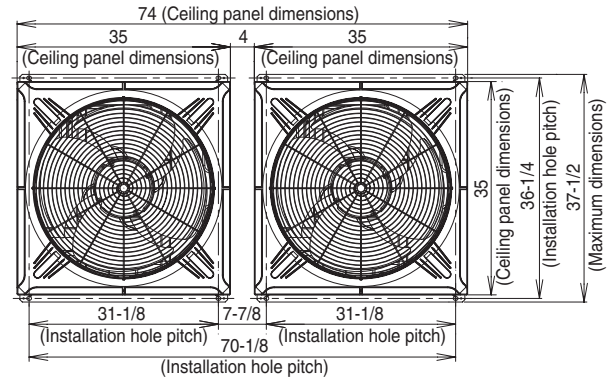
Equivalent tonnage	Size in. (mm)					
	a	b	c	d	e	f
6-Ton	10-1/8 (257)	10-25/32 (274)	12-29/32 (328)	3-35/64 (90)	5-63/64 (152)	8-17/64 (210)
8-Ton	6-37/64 (167)	6-27/32 (174)	12-29/32 (328)	3-35/64 (90)	5-63/64 (152)	8-17/64 (210)

* Measurements for 8-Ton assume that the supplied connection tubing is used.

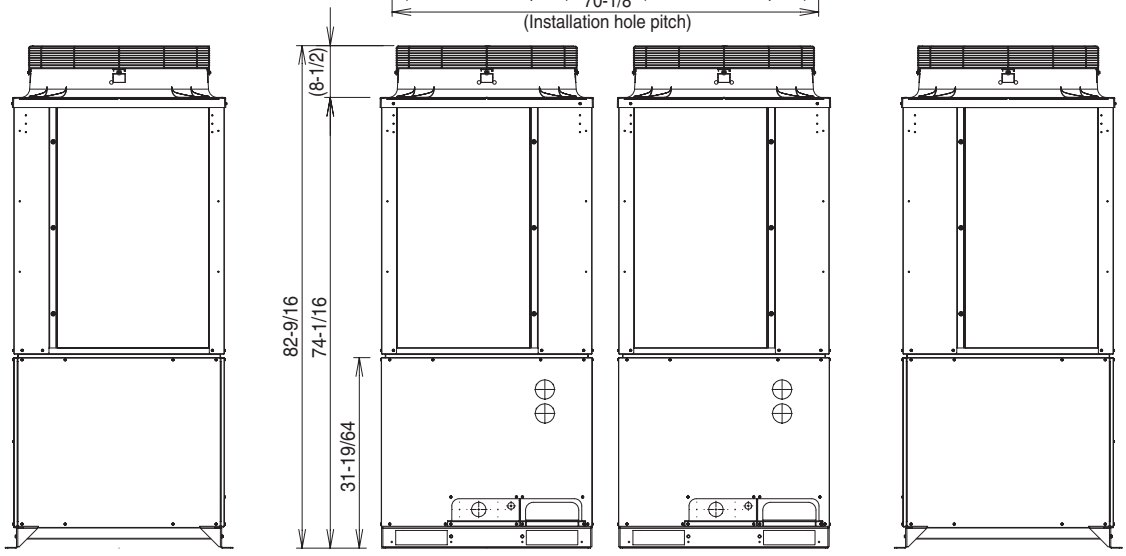
1-4. Multiple Unit Installation Example

unit: in.

Equivalent tonnage	6-Ton	8-Ton
	U-72MF1U9 U-72MF1U9E	U-96MF1U9 U-96MF1U9E
12-Ton	○○	–
14-Ton	○	○
16-Ton	–	○○

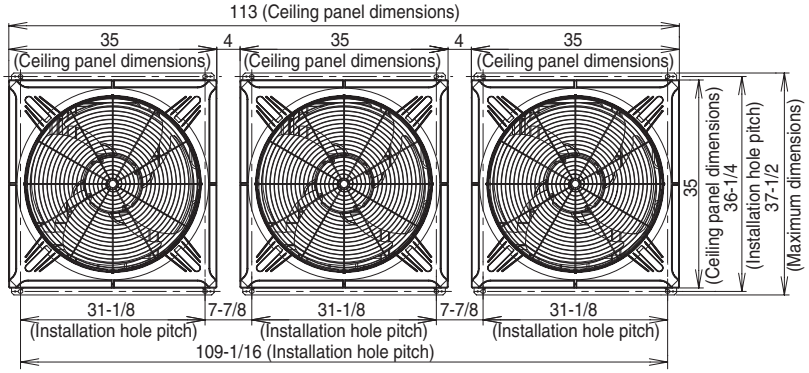


Top view

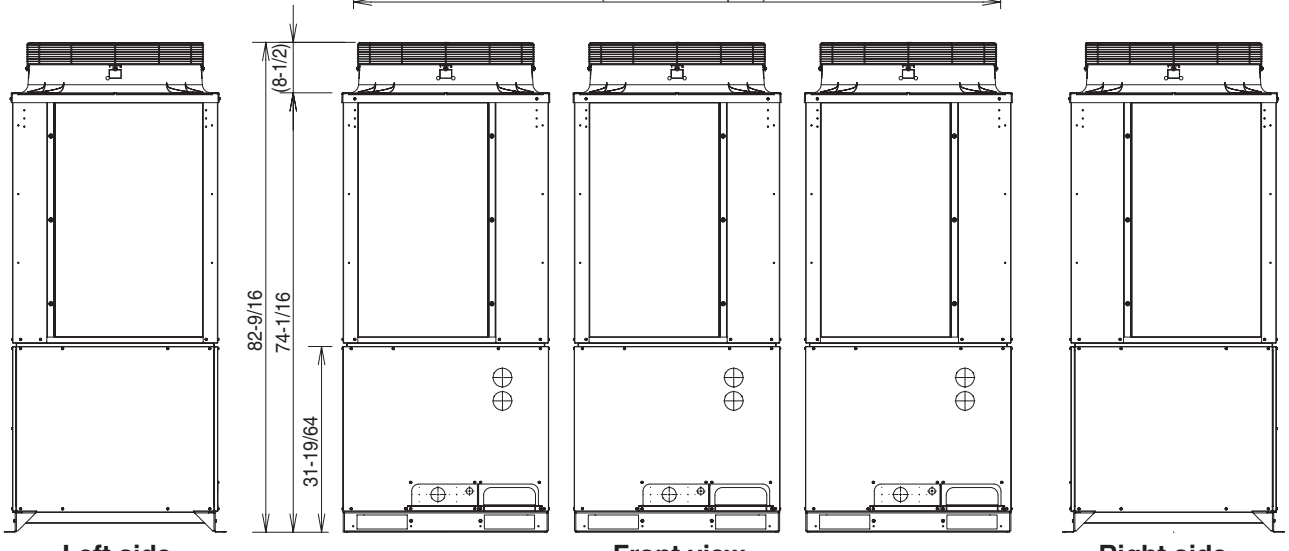


Left side **Front view** **Right side**

Equivalent tonnage	6-Ton	8-Ton
	U-72MF1U9 U-72MF1U9E	U-96MF1U9 U-96MF1U9E
18-Ton	○○○	–
20-Ton	○○	○
22-Ton	○	○○
24-Ton	–	○○○



Top view

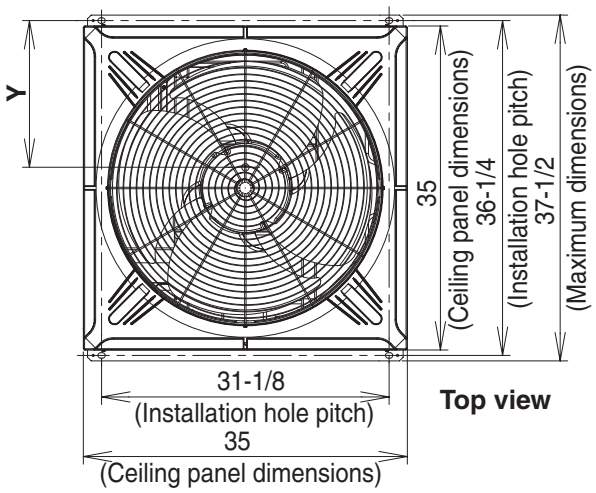


Left side **Front view** **Right side**

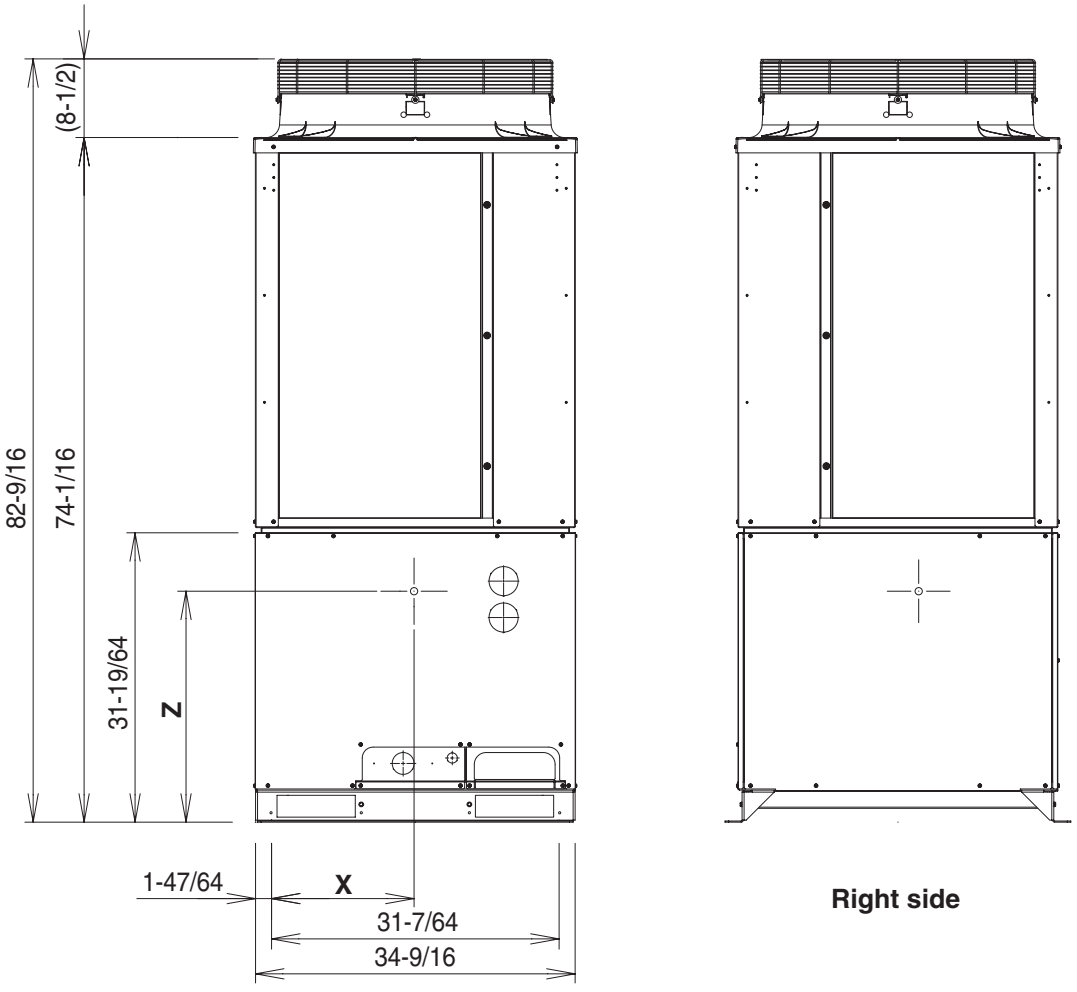
4

Position of center of gravity

MODEL		U-72MF1U9 U-72MF1U9E	U-96MF1U9 U-96MF1U9E
Position of center of gravity in. (mm)	X	15-3/8 (392)	13-1/4 (336)
	Y	17-3/4 (452)	18-7/8 (481)
	Z	33-5/8 (853)	30-1/4 (767)
Weight lbs (kg)		573 (260)	683 (310)



Top view



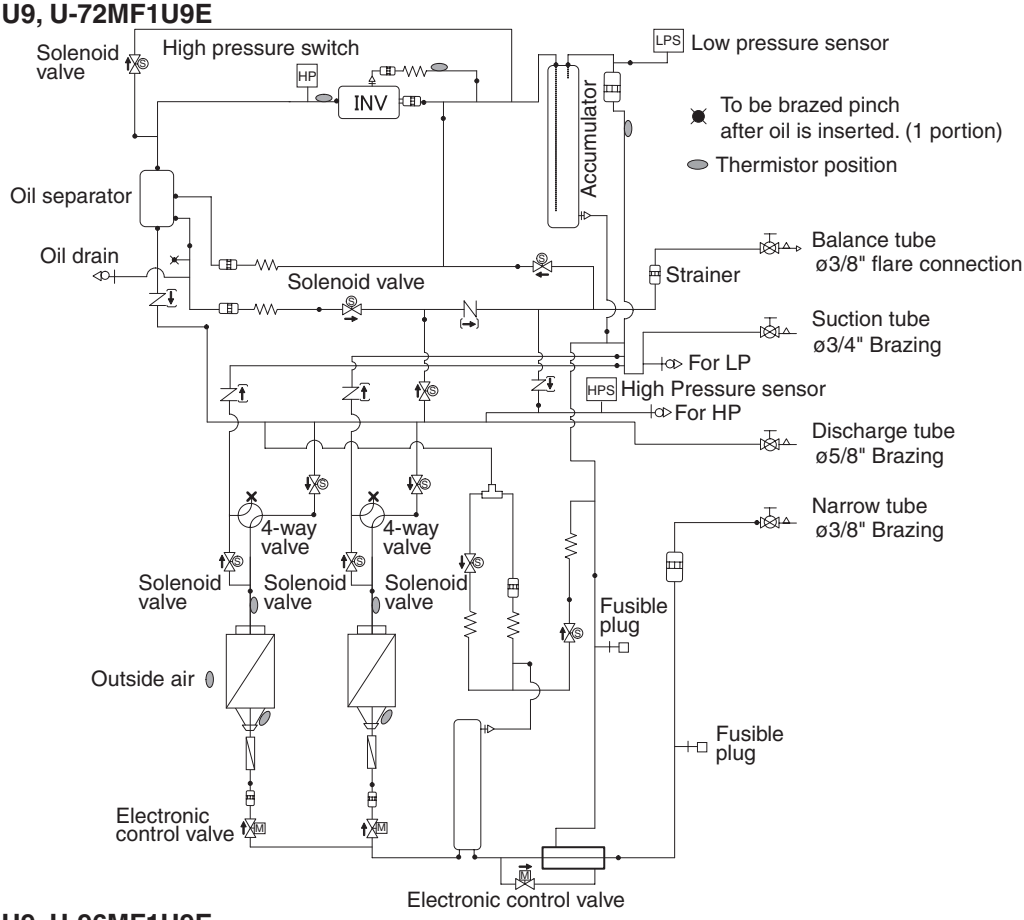
Front view

Right side

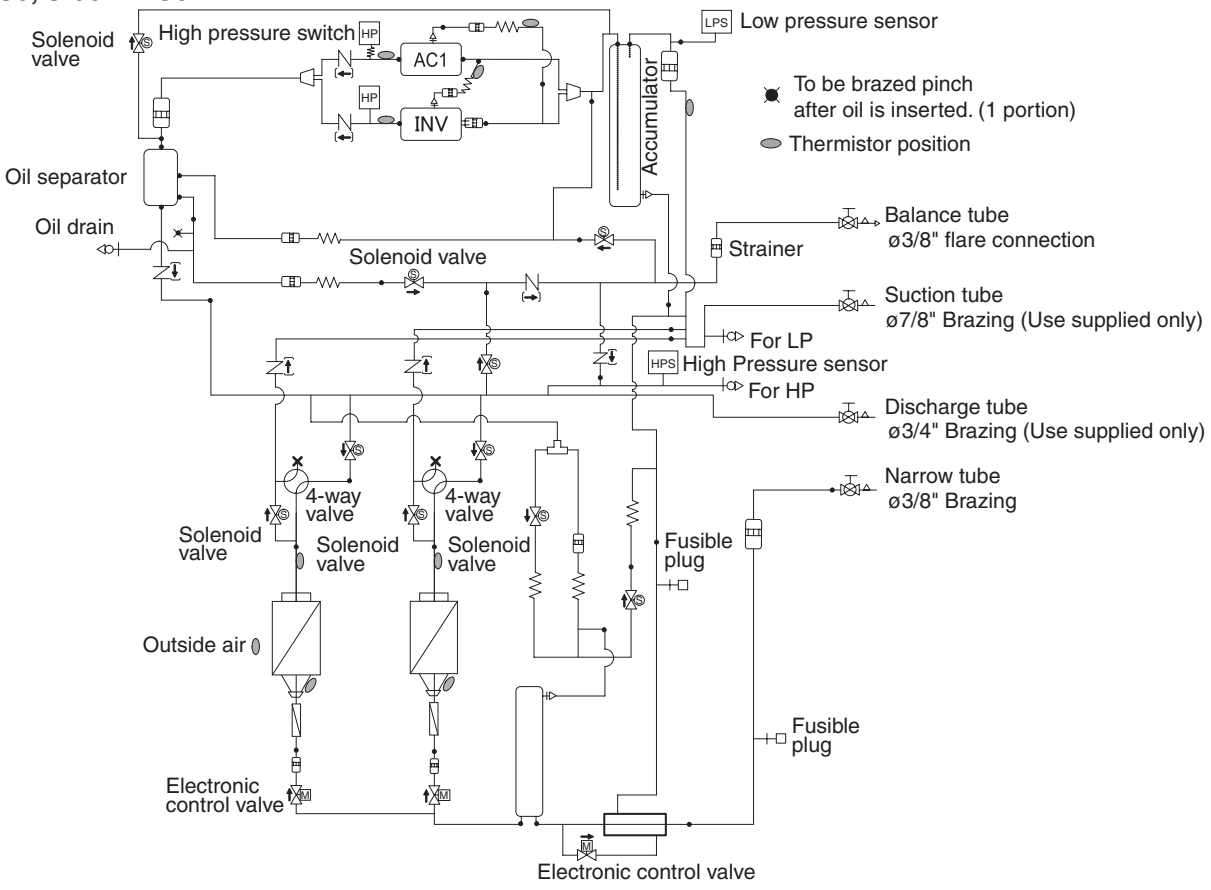
unit : in.

1-5. Refrigerant Flow Diagram

U-72MF1U9, U-72MF1U9E

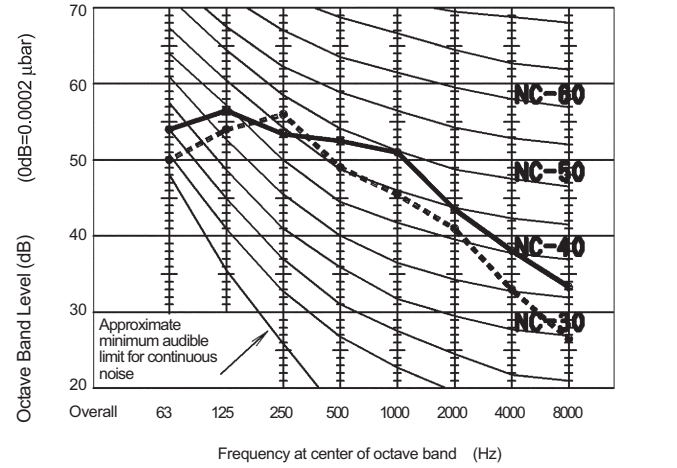


U-96MF1U9, U-96MF1U9E

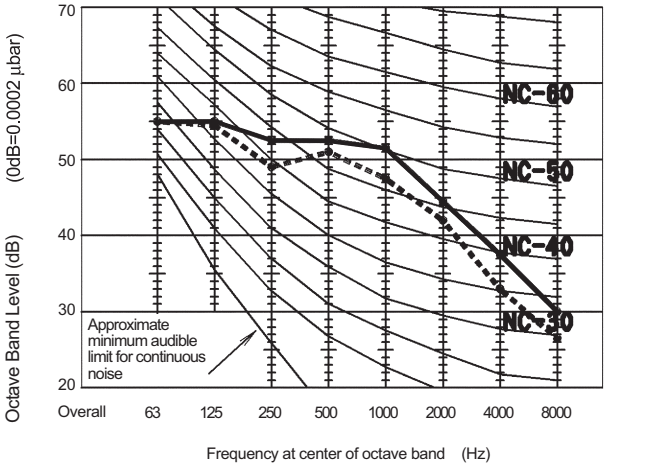


1-6. Noise Criterion Curves

MODEL	U-72MF1U9, U-72MF1U9E
SOUND LEVEL dB(A) (Cooling/Heating)	54.5 (Quiet mode 51.5)
CONDITION	3.3 ft front at height of 4.9 ft



MODEL	U-96MF1U9, U-96MF1U9E
SOUND LEVEL dB(A) (Cooling/Heating)	55.0 (Quiet mode 52.0)
CONDITION	3.3 ft in front at height of 4.9 ft



4

Contents

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2. Test Run Procedure 5-3
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4. Auto Address Setting 5-6
5. Remote Controller Test Run Settings 5-12
6. Caution for Pump Down.....5-12
7. Meaning of Alarm Messages 5-13

1. Preparing for Test Run

1. Preparing for Test Run

- Before attempting to start the air conditioner, check the following.

(1) The control wiring is correctly connected and all electrical connections are tight.

(2) The transportation pads for the indoor fan have been removed. If not, remove them now.

(3) The power has been connected to the unit for at least 5 hours before starting the compressor. The bottom of the compressor should be warm to the touch and the crankcase heater around the feet of the compressor should be hot to the touch.
(Fig. 5-1)

(4) If only 1 outdoor unit is installed, close the service valve on the balance tubes, and open the service valve on the other 3 tubes (suction, discharge, and liquid tubes). (Fig. 5-2)
If 2 or 3 outdoor units are installed, open the service valves on all 4 tubes (suction, discharge, liquid, and balance tubes). (Fig. 5-2)

(5) Request that the customer be present for the trial run. Explain the contents of the instruction manual, then have the customer actually operate the system.

(6) Be sure to give the instruction manual and warranty certificate to the customer.

(7) When replacing the control PCB, be sure to make all the same settings on the new PCB as were in use before replacement.
The existing EEP ROM is not changed, and is connected to the new control PCB.

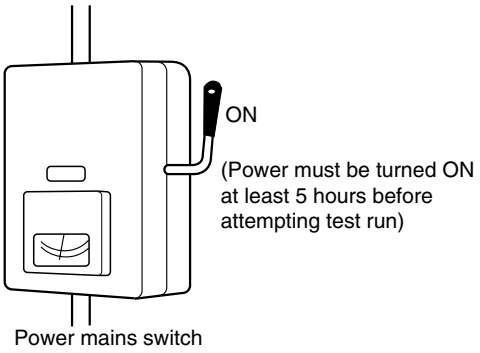


Fig. 5-1

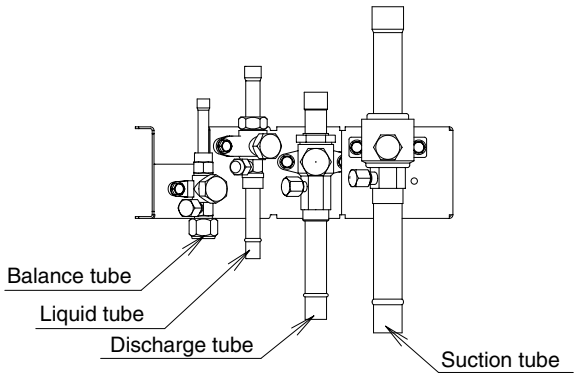
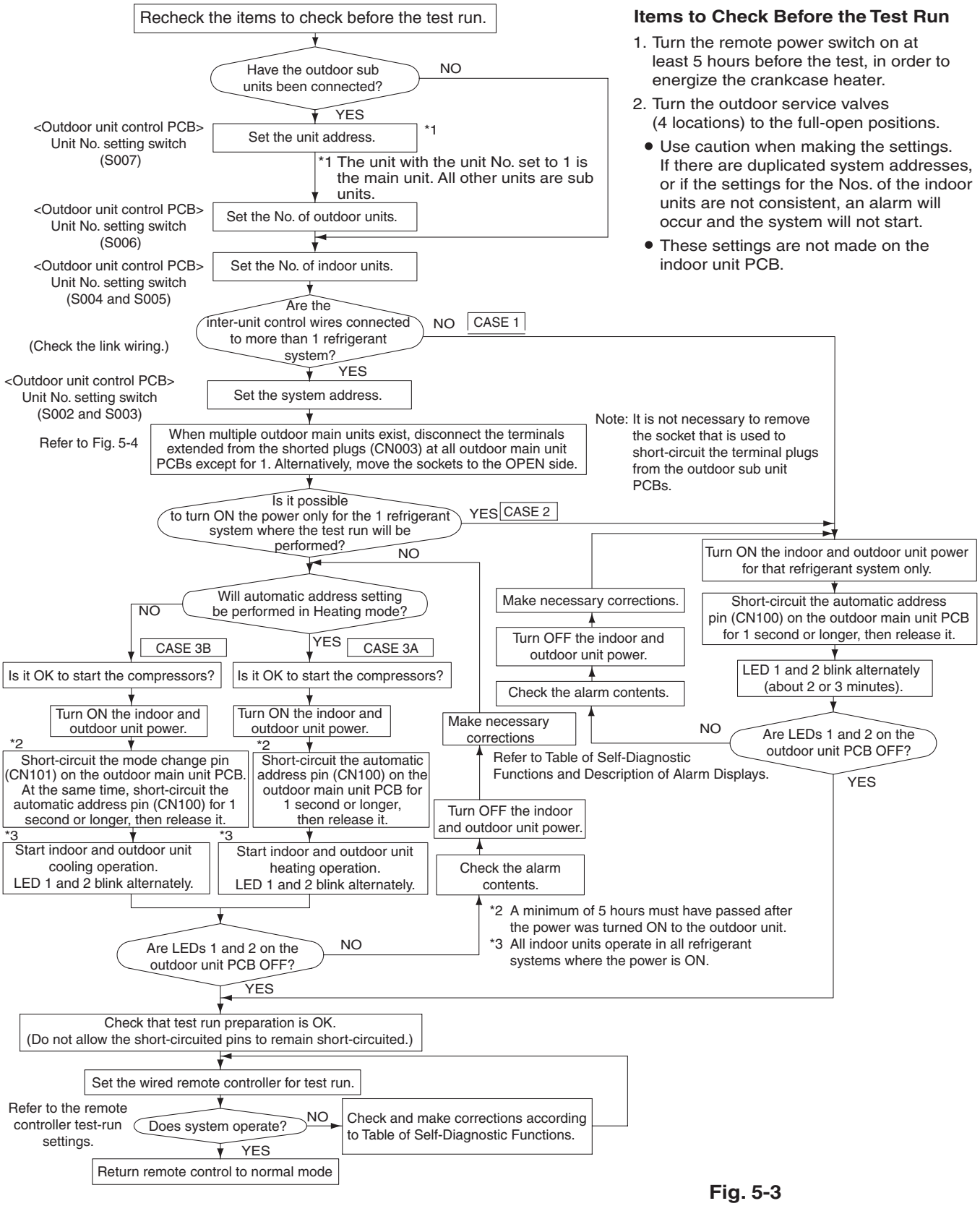


Fig. 5-2

2. Test Run Procedure

2. Test Run Procedure


Recheck the items to check before the test run.
Have the outdoor sub units been connected?
NO
YES
<Outdoor unit control PCB> Unit No. setting switch (S007)
Set the unit address.
*1
*1 The unit with the unit No. set to 1 is the main unit. All other units are sub units.
<Outdoor unit control PCB> Unit No. setting switch (S006)
Set the No. of outdoor units.
<Outdoor unit control PCB> Unit No. setting switch (S004 and S005)
Set the No. of indoor units.
Are the inter-unit control wires connected to more than 1 refrigerant system?
NO
CASE 1
(Check the link wiring.)
YES
<Outdoor unit control PCB> Unit No. setting switch (S002 and S003)
Set the system address.
Refer to Fig. 5-4
When multiple outdoor main units exist, disconnect the terminals extended from the shorted plugs (CN003) at all outdoor main unit PCBs except for 1. Alternatively, move the sockets to the OPEN side.
Note: It is not necessary to remove the socket that is used to short-circuit the terminal plugs from the outdoor sub unit PCBs.
Is it possible to turn ON the power only for the 1 refrigerant system where the test run will be performed?
YES
CASE 2
NO
Will automatic address setting be performed in Heating mode?
NO
YES
CASE 3B
CASE 3A
Is it OK to start the compressors?
Is it OK to start the compressors?
Turn ON the indoor and outdoor unit power.
Turn ON the indoor and outdoor unit power.
*2
Short-circuit the mode change pin (CN101) on the outdoor main unit PCB. At the same time, short-circuit the automatic address pin (CN100) for 1 second or longer, then release it.
*2
Short-circuit the automatic address pin (CN100) on the outdoor main unit PCB for 1 second or longer, then release it.
*3
Start indoor and outdoor unit cooling operation. LED 1 and 2 blink alternately.
*3
Start indoor and outdoor unit heating operation. LED 1 and 2 blink alternately.
Are LEDs 1 and 2 on the outdoor unit PCB OFF?
NO
YES
Turn ON the indoor and outdoor unit power for that refrigerant system only.
Short-circuit the automatic address pin (CN100) on the outdoor main unit PCB for 1 second or longer, then release it.
LED 1 and 2 blink alternately (about 2 or 3 minutes).
Are LEDs 1 and 2 on the outdoor unit PCB OFF?
NO
YES
Make necessary corrections.
Turn OFF the indoor and outdoor unit power.
Check the alarm contents.
Make necessary corrections
Refer to Table of Self-Diagnostic Functions and Description of Alarm Displays.
Turn OFF the indoor and outdoor unit power.
Check the alarm contents.
*2 A minimum of 5 hours must have passed after the power was turned ON to the outdoor unit.
*3 All indoor units operate in all refrigerant systems where the power is ON.
Check that test run preparation is OK. (Do not allow the short-circuited pins to remain short-circuited.)
Set the wired remote controller for test run.
Refer to the remote controller test-run settings.
Does system operate?
NO
YES
Check and make corrections according to Table of Self-Diagnostic Functions.
Return remote control to normal mode

Items to Check Before the Test Run

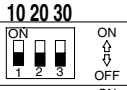
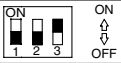
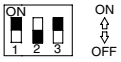
1. Turn the remote power switch on at least 5 hours before the test, in order to energize the crankcase heater.
2. Turn the outdoor service valves (4 locations) to the full-open positions.
   - Use caution when making the settings. If there are duplicated system addresses, or if the settings for the Nos. of the indoor units are not consistent, an alarm will occur and the system will not start.
   - These settings are not made on the indoor unit PCB.

Fig. 5-3

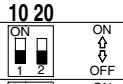
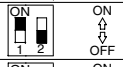
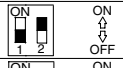
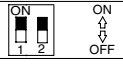
5

3. Main Outdoor Unit PCB Setting

● **Examples of the No. of indoor units settings (S005, S004)**

No. of indoor units	Indoor unit setting (S005) (3P DIP switch, blue) 10 20 30	Indoor unit setting (S004) (Rotary switch, red)
1 unit (factory setting)	All OFF 	Set to 1
11 units	1 ON	Set to 1
21 units	2 ON	Set to 1
31 units	3 ON 	Set to 1
40 units	1 & 3 ON 	Set to 0

● **Examples of refrigerant circuit (R.C.) address settings (required when link wiring is used) (S003, S002)**

System address No.	System address (S003) (2P DIP switch, blue) 10 20	System address (S002) (Rotary switch, black)
System 1 (factory setting)	Both OFF 	Set to 1
System 11	1 ON 	Set to 1
System 21	2 ON 	Set to 1
System 30	1 & 2 ON 	Set to 0

● **Examples of the No. of outdoor units settings (S006)**

No. of outdoor units	Outdoor unit setting (S006) (3P DIP switch, blue)
1 unit (factory setting)	1 ON
2 units	2 ON
3 units	1 & 2 ON

● **Address setting of main outdoor unit (S007)**

Unit No. setting	Address setting of outdoor unit (S007) (3P DIP switch, blue)
Unit No. 1 (main unit)	

● **Address setting of sub outdoor unit**

Unit No. setting	Address setting of outdoor unit (S007) (3P DIP switch, blue)
Unit No. 2 (sub unit)	2 ON
Unit No. 3 (sub unit)	1 & 2 ON

The sub unit control PCB contains the same switches as the main unit control PCB for No. of indoor units, No. of outdoor units, and system address. However it is not necessary to set these switches.

3. Main Outdoor Unit PCB Setting

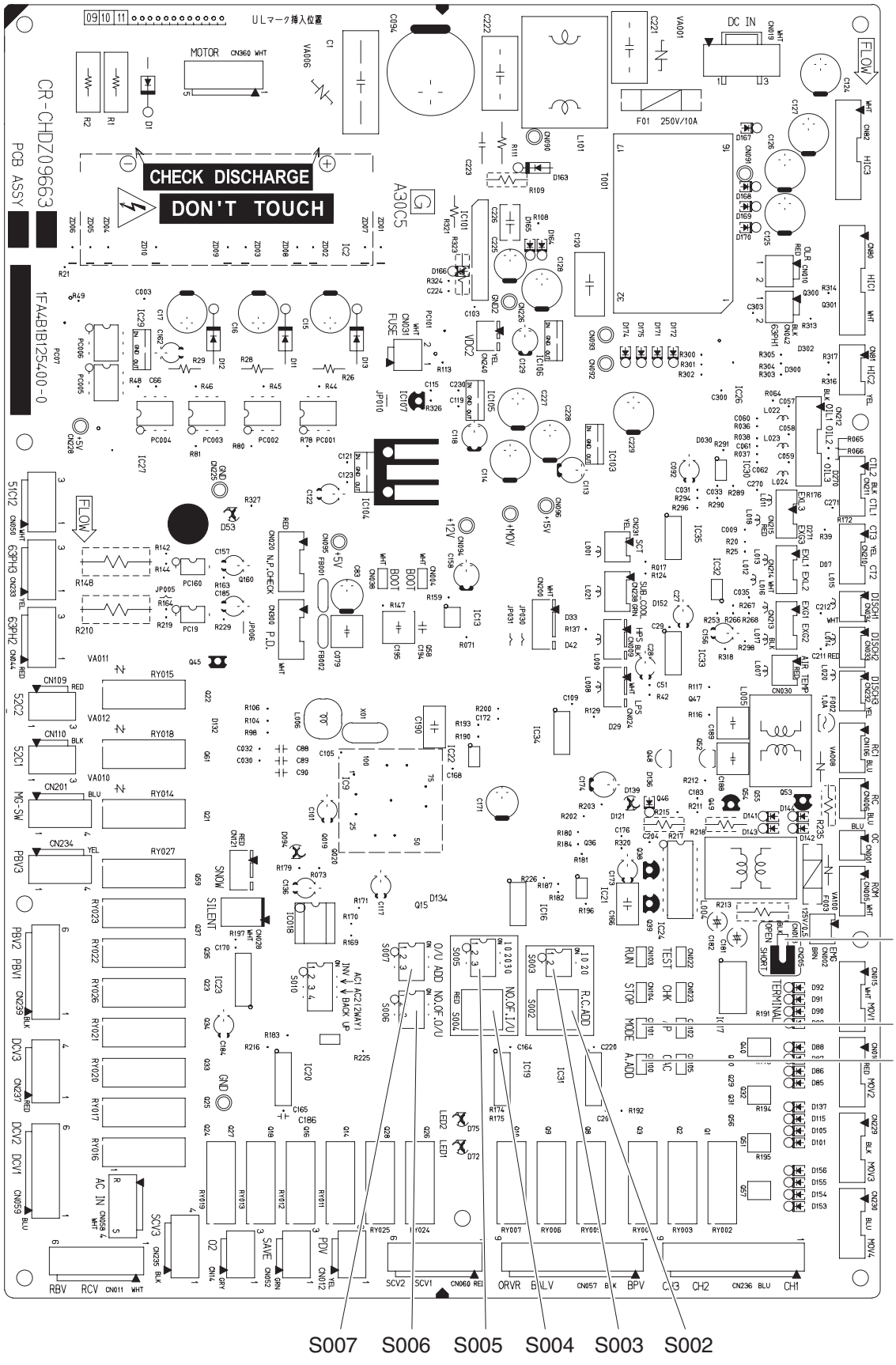


Fig. 5-4

4. Auto Address Setting

Basic wiring diagram: Example (1)

- **If link wiring is not used (The inter-unit control wires are not connected to multiple refrigerant systems.)**
  Indoor unit addresses can be set without operating the compressors.

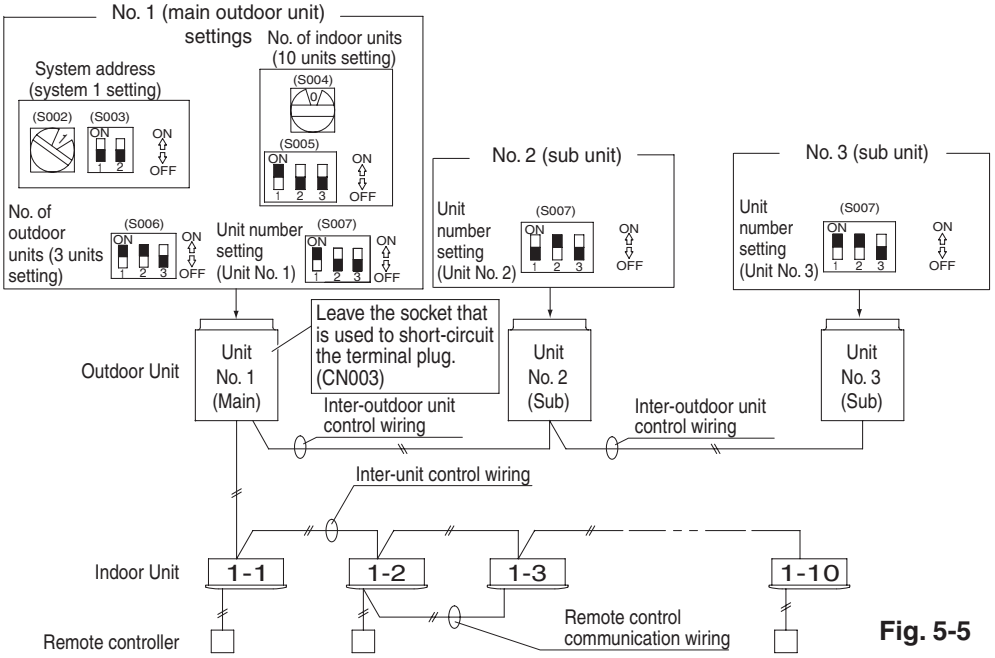
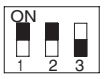
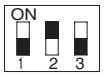
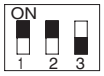


Fig. 5-5

Case 1

(1) Automatic Address Setting from the Outdoor Unit

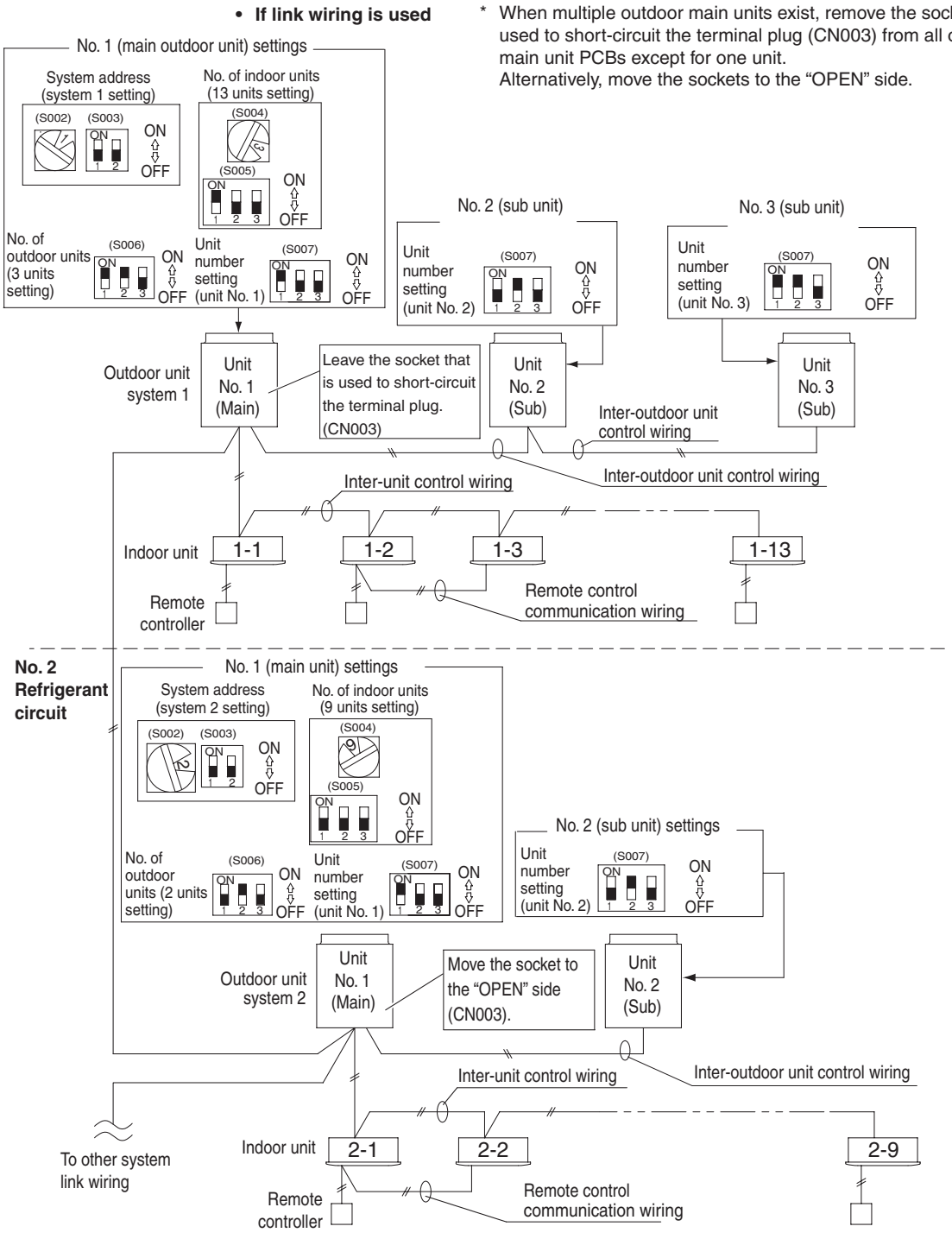
1. To set the number of outdoor units, on the outdoor main unit control PCB set the No. of outdoor units DIP switch (S006) to  (3 units), and set the unit No. DIP switch (S007) to (unit No. 1 - main outdoor unit).
2. On the No. 2 (sub) unit control PCB, set the unit No. switch (S007) to  (unit No. 2).
   On the No. 3 (sub) unit control PCB, set the unit No. switch (S007) to  (unit No. 3).
3. On the outdoor main unit control PCB, check that the system address rotary switch (S002) is set to "1" and that the DIP switch (S003) is set to "0." (These are the settings at the time of factory shipment.)
4. To set the number of indoor units that are connected to the outdoor unit to 10 on the outdoor main unit control PCB, set the No. of indoor units DIP switch (S005) to "1." and set the rotary switch (S004) to "0."
5. Turn ON the power to the indoor and outdoor units.
6. On the outdoor main unit control PCB, short-circuit the automatic address pin (CN100) for 1 second or longer, then release it.
   ↓
   (Communication for automatic address setting begins.)
   ↓
   * To cancel, again short-circuit the automatic address pin (CN100) for 1 second or longer, then release it. The LED that indicates that automatic address setting is in progress turns OFF and the process is stopped. Be sure to perform automatic address setting again.

   (Automatic address setting is completed when LEDs 1 and 2 on the outdoor main unit control PCB turn OFF.)
   ↓
7. Operation from the remote controllers is now possible.
   * To perform automatic address setting from the remote controller, perform steps 1 to 5, then use the remote controller and complete automatic address setting.

● Refer to "Automatic Address Setting from the Remote Controller."

4. Auto Address Setting

Basic wiring diagram: Example (2)


• If link wiring is used
No. 1 (main outdoor unit) settings
System address (system 1 setting)
No. of indoor units (13 units setting)
(S002) (S003) (S004) (S005)
ON OFF
No. of outdoor units (3 units setting)
(S006)
Unit number setting (unit No. 1)
(S007)
No. 2 (sub unit)
Unit number setting (unit No. 2)
No. 3 (sub unit)
Unit number setting (unit No. 3)
Outdoor unit system 1
Unit No. 1 (Main)
Leave the socket that is used to short-circuit the terminal plug. (CN003)
Unit No. 2 (Sub)
Unit No. 3 (Sub)
Inter-outdoor unit control wiring
Inter-unit control wiring
Indoor unit
1-1
1-2
1-3
1-13
Remote controller
Remote control communication wiring
No. 2 Refrigerant circuit
No. 1 (main unit) settings
System address (system 2 setting)
No. of indoor units (9 units setting)
No. of outdoor units (2 units setting)
No. 2 (sub unit) settings
Outdoor unit system 2
Move the socket to the "OPEN" side (CN003).
To other system link wiring
2-1
2-2
2-9

* When multiple outdoor main units exist, remove the socket that is used to short-circuit the terminal plug (CN003) from all outdoor main unit PCBs except for one unit.
Alternatively, move the sockets to the "OPEN" side.

Make settings as appropriate for the cases listed below.
(Refer to the instructions on the following pages.)

- **Indoor and outdoor unit power can be turned ON for each system separately.** → Case 2
- **Indoor and outdoor unit power cannot be turned ON for each system separately.**
  - Automatic address setting in Heating mode → Case 3A
  - Automatic address setting in Cooling mode → Case 3B

Fig. 5-6

4. Auto Address Setting

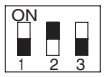
Case 2 **Automatic Address Setting (no compressor operation)**

- Indoor and outdoor unit power can be turned ON for each system separately.
  Indoor unit addresses can be set without operating the compressors.

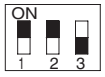
Automatic Address Setting from Outdoor Unit

1. On the No. 1 (main) unit control PCB, set the unit No. switch (S007) to

(unit No. 1).

   On the No. 2 (sub) unit control PCB, set the unit No. switch (S007) to 

(unit No. 2).

   On the No. 3 (sub) unit control PCB, set the unit No. switch (S007) to 

(unit No. 3).

2. To set the number of outdoor units on the outdoor main unit control PCB, set the No. of outdoor units DIP switch (S006) to

(3 units).

3. On the outdoor main unit control PCB, check that the system address rotary switch (S002) is set to “1” and that the DIP switch (S003) is set to “0”

. (These are the settings at the time of factory shipment.)

4. To set the number of indoor units that are connected to the outdoor unit to 13 on the outdoor main unit control PCB, set the No. of indoor units DIP switch (S005) to “1”

, and set the rotary switch (S004) to “3.”

5. Turn on power to all indoor and outdoor units in the system.

6. Short-circuit the automatic address pin at the outdoor main unit (CN100) for 1 second or longer, then release it.

   ↓

   (Communication for automatic address setting begins.)

   ↓ * To cancel, again short-circuit the automatic address pin (CN100) for 1 second or longer, then release it. The LED that indicates automatic address setting is in progress turns OFF and the process is stopped. Be sure to perform automatic address setting again.

   (Automatic address setting is completed when LEDs 1 and 2 on the outdoor main unit control PCB turn OFF.)

   ↓

7. Next turn the power ON only for the indoor and outdoor units of the next (different) system. Repeat steps 1 - 5 in the same way to complete automatic address settings for all systems.

   ↓

8. Operation from the remote controllers is now possible.
   * To perform automatic address setting from the remote controller, perform steps 1 - 5, then use the remote controller and complete automatic address setting.

- Refer to “Automatic Address Setting from Remote Controller.”

4. Auto Address Setting

Case 3A **Automatic Address Setting in Heating Mode**

- Indoor and outdoor unit power cannot be turned ON for each system separately.
  In the following, automatic setting of indoor unit addresses is not possible if the compressors are not operating.
  Therefore perform this process only after completing all refrigerant tubing work.

Automatic Address Setting from Outdoor Unit

1. Perform steps 1 - 4 in the same way as for Case 2 .
5. Turn the indoor and outdoor unit power ON at all systems.

↓

6. To perform automatic address setting in Heating mode , on the outdoor main unit control PCB in the refrigerant system where you wish to set the addresses, short-circuit the automatic address pin (CN100) for 1 second or longer, then release it. (Be sure to perform this process for one system at a time. Automatic address settings cannot be performed for more than one system at the same time.)

   ↓

   (Communication for automatic address setting begins, **the compressors turn ON, and automatic address setting in Heating mode begins.**)
   (All indoor units operate.)

   ↓ * To cancel, again short-circuit the automatic address pin (CN100) for 1 second or longer, then release it. The LED that indicates automatic address setting is in progress turns OFF and the process is stopped. Be sure to perform automatic address setting again.

   (Automatic address setting is completed when the compressors stop and LEDs 1 and 2 on the main unit control PCB turn OFF.)

   ↓

7. At the outdoor main unit in the next (different) system, short-circuit the automatic address pin (CN100) for 1 second or longer, then release it.

   ↓

   (Repeat the same steps to complete automatic address setting for all units.)

   ↓

8. Operation from the remote controllers is now possible.
   * To perform automatic address setting from the remote controller, perform steps 1 - 5, then use the remote controller and complete automatic address setting.

- Refer to “Automatic Address Setting from Remote Controller.”

4. Auto Address Setting

Case 3B **Automatic Address Setting in Cooling Mode**

- Indoor and outdoor unit power cannot be turned ON for each system separately.
  In the following, automatic setting of indoor unit addresses is not possible if the compressors are not operating.
  Therefore perform this process only after completing all refrigerant tubing work.
  Automatic address setting can be performed during Cooling operation.

Automatic Address Setting from Outdoor Unit

1. Perform steps 1 – 4 in the same way as for Case 2.
5. Turn the indoor and outdoor unit power ON at all systems.

   ↓
6. To perform automatic address setting in Cooling mode, on the outdoor main unit control PCB in the refrigerant system where you wish to set the addresses, short-circuit the mode change 2P pin (CN101). At the same time, short-circuit the automatic address pin (CN100) for 1 second or longer, then release it. (Be sure to perform this process for one system at a time. Automatic address settings cannot be performed for more than one system at the same time.)

   ↓

   (Communication for automatic address setting begins, **the compressors turn ON, and automatic address setting in Cooling mode begins.)**

   (All indoor units operate.)

   ↓

   * To cancel, again short-circuit the automatic address pin (CN100) for 1 second or longer, then release it. The LED that indicates automatic address setting is in progress turns OFF and the process is stopped. Be sure to perform automatic address setting again.

   (Automatic address setting is completed when the compressors stop and LEDs 1 and 2 on the outdoor main unit control PCB turn OFF.)
7. At the outdoor main unit in the next (different) system, short-circuit the automatic address pin (CN100) for 1 second or longer, then release it.

   ↓

   (Repeat the same steps to complete automatic address setting for all units.)

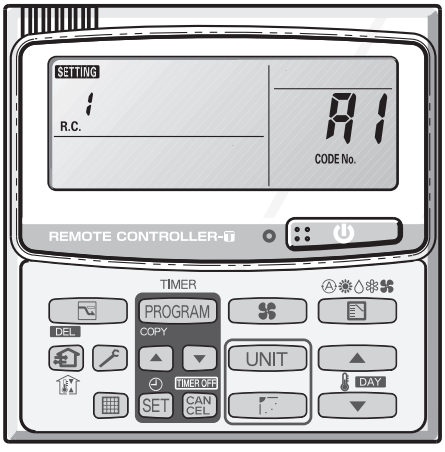
   ↓
8. Operation from the remote controllers is now possible.

* Automatic address setting in Cooling mode cannot be done from the remote controller.

Automatic Address Setting* from the Remote Controller

Selecting each refrigerant system individually for automatic address setting

---Automatic address setting for each system: Item code “A1”



1. Press the remote controller timer time ▲ button and 🔧 button at the same time.
   (Press and hold for 4 seconds or longer.)
2. Next, press either the temperature setting ▲ or ▼ button.
   (Check that the item code is “A1.”)
3. Use either the UNIT or ⊡ button to set the system No. to perform automatic address setting.
4. Then press the SET button.

   (Automatic address setting for one refrigerant system begins.)

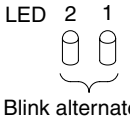
   (When automatic address setting for one system is completed, the system returns to normal stopped status.) <Approximately 4 – 5 minutes is required.>

   (During automatic address setting, “ SETTING ” is displayed on the remote controller. This message disappears when automatic address setting is completed.)
5. Repeat the same steps to perform automatic address setting for each successive system.

4. Auto Address Setting

Display during automatic address setting

- On outdoor main unit PCB



* Do not short-circuit the automatic address setting pin (CN100) again while automatic address setting is in progress. Doing so will cancel the setting operation and will cause LEDs 1 and 2 to turn OFF.

* When automatic address setting has been successfully completed, both LEDs 1 and 2 turn OFF.

* LED 1 is D72. LED 2 is D75.

* If automatic address setting is not completed successfully, refer to the table below and correct the problem. Then perform automatic address setting again.

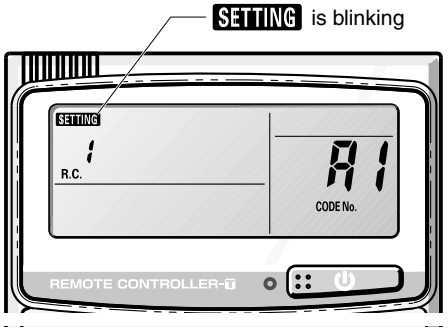
- Display details of LEDs 1 and 2 on the outdoor unit control PCB

(☼: ON ✷: Blinking ●: OFF)

LED 1	LED 2	Display meaning
☼	☼	After the power is turned ON (and automatic address setting is not in progress), no communication with the indoor units in that system is possible.
●	☼	After the power is turned ON (and automatic address setting is not in progress), 1 or more indoor units are confirmed in that system; however, the number of indoor units does not match the number that was set.
✷ Alternating	✷ Alternating	Automatic address setting is in progress.
●	●	Automatic address setting completed.
✷ Simultaneous	✷ Simultaneous	At time of automatic address setting, the number of indoor units did not match the number that was set. "⚠" (when indoor units are operating) indication appears on the display.
✷ Alternating	✷ Alternating	Refer to "Table of Self-Diagnostic Functions and Description of Alarm Displays."

Note: "⚠" indicates that the solenoid is fused or that there is a CT detection current failure (current is detected when the compressor is OFF).

- Remote controller display



5

Request concerning recording the indoor/outdoor unit combination Nos.

After automatic address setting has been completed, be sure to record them for future reference.

List the outdoor main unit system address and the addresses of the indoor units in that system in an easily visible location (next to the nameplate), using a permanent marking pen or similar means that cannot be abraded easily.

Example: (Outdoor) 1 – (Indoor) 1-1, 1-2, 1-3… (Outdoor) 2 – (Indoor) 2-1, 2-2, 2-3…

These numbers are necessary for later maintenance. Please be sure to indicate them.

Checking the indoor unit addresses

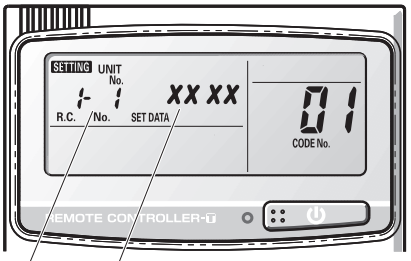
Use the remote controller to check the indoor unit address.

<If 1 indoor unit is connected to 1 remote controller>

1. Press and hold the button and button for 4 seconds or longer (simple settings mode).
2. The address is displayed for the indoor unit that is connected to the remote controller.
   (Only the address of the indoor unit that is connected to the remote controller can be checked.)
3. Press the button again to return to normal remote controller mode.

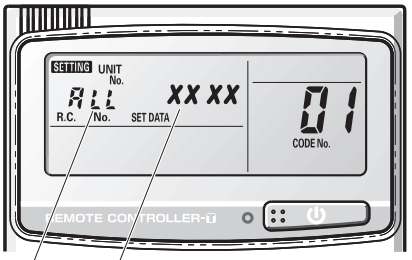
<If multiple indoor units are connected to 1 remote controller (group control)>

1. Press and hold the button and button for 4 seconds or longer (simple settings mode).
2. "ALL" is displayed on the remote controller.
3. Next, press the UNIT button.
4. The address is displayed for 1 of the indoor units which is connected to the remote controller. Check that the fan of that indoor unit starts and that air is discharged.
5. Press the UNIT button again and check the address of each indoor unit in sequence.
6. Press the button again to return to normal remote controller mode.



5. Remote Controller Test Run Settings

1. Press the remote controller button for 4 seconds or longer. Then press the button.
   "TEST" appears on the LCD display while the test run is in progress.
   The temperature cannot be adjusted when in Test Run mode.
   (This mode places a heavy load on the machines. Therefore use it only when performing the test run.)
2. The test run can be performed using the HEAT, COOL, or FAN operation modes.
   Note: The outdoor units will not operate for approximately 3 minutes after the power is turned ON and after operation is stopped.
3. If correct operation is not possible, a code is displayed on the remote controller LCD display.
   (Refer to "Table of Self-Diagnostic Functions" and correct the problem.)



4. After the test run is completed, press the button again. Check that "TEST" disappears from the LCD display. (To prevent continuous test runs, this remote controller includes a timer function that cancels the test run after 60 minutes.)

* If the test run is performed using the wired remote controller, operation is possible even if the cassette-type ceiling panel has not been installed. ("P09" display does not occur.)

6. Caution for Pump Down

Pump down means refrigerant gas in the system is returned to the outdoor unit. Pump down is used when the unit is to be moved, or before servicing the refrigerant circuit. (Refer to the Service Manual)

CAUTION

This outdoor unit cannot collect more than the rated refrigerant amount as shown by the nameplate on the back.

If the amount of refrigerant is more than that recommended, do not conduct pump down.

In this case use another refrigerant collecting system.

7. Meaning of Alarm Messages

Table of Self-Diagnostics Functions and Description of Alarm Displays

Alarm messages are indicated by the blinking of LED 1 and 2 (D72, D75) on the outdoor unit PCB. They are also displayed on the wired remote controller.

- Viewing the LED 1 and 2 (D72 and D75) alarm displays

LED 1	LED 2	Alarm contents
☼	☼	Alarm display LED 1 blinks M times, then LED 2 blinks N times. The cycle then repeats. M = 2: P alarm 3: H alarm 4: E alarm 5: F alarm 6: L alarm N = Alarm No. Example: LED 1 blinks 2 times, then LED 2 blinks 17 times. The cycle then repeats. Alarm is "P17".
Alternating		

(☼ : Blinking)

Possible cause of malfunction			Alarm message
Serial communication errors Mis-setting	Remote controller is detecting error signal from indoor unit.	Error in receiving serial communication signal. (Signal from main indoor unit in case of group control) Ex: Auto address is not completed.	<E01>
		Error in transmitting serial communication signal.	<E02>
	Indoor unit is detecting error signal from remote controller (and system controller).		<<E03>>
	Indoor unit is detecting error signal from main outdoor unit.	Error in receiving serial communication signal. When turning on the power supply, the number of connected indoor units does not correspond to the number set. (Except R.C. address is "0".)	E04
		Error of the main outdoor unit in receiving serial communication signal from the indoor unit.	<E06>
	Improper setting of indoor unit or remote controller.	Indoor unit address setting is duplicated.	E08
		Remote control address connector (RCU. ADR) is duplicated. (Duplication of main remote controller)	<<E09>>
	During auto. address setting, number of connected units does not correspond to number set. When turning on the power supply, number of connected units does not correspond to number set. (Except R.C. address is "0".)	Starting auto. address setting is prohibited. This alarm message shows that the auto address connector CN100 is shorted while other RC line is executing auto address operation.	E12
		Error in auto. address setting. (Number of connected indoor units is less than the number set.)	E15
		Error in auto. address setting. (Number of connected indoor units is more than the number set.)	E16
		No indoor unit is connected during auto. address setting.	E20
		Main outdoor unit is detecting error signal from sub outdoor unit.	E24
		Error of outdoor unit address setting.	E25
		The number of connected main and sub outdoor units do not correspond to the number set at main outdoor unit PCB.	E26
		Error of sub outdoor unit in receiving serial communication signal from main outdoor unit.	E29
	Indoor unit communication error of group control wiring.	Error of main indoor unit in receiving serial communication signal from sub indoor units.	E18
	Improper setting.	This alarm message shows when an indoor unit for multiple-use is not connected to the outdoor unit.	L02
		Duplication of main indoor unit address setting in group control.	<L03>
		Duplication of outdoor R.C. address setting.	L04
		There are 2 or more indoor unit controllers that have operation mode priority in refrigerant circuit. — Priority set remote controller	L05
		There are 2 or more indoor unit controllers that have operation mode priority in refrigerant circuit. — Non-priority set remote controller	L06
		Group control wiring is connected to individual control indoor unit.	L07
		Indoor unit address is not set.	L08
		Capacity code of indoor unit is not set.	<<L09>>
		Capacity code of outdoor unit is not set.	L10
		Mis-match connection of outdoor units that have different kinds of refrigerant.	L17

Continued

7. Meaning of Alarm Messages

Possible cause of malfunction			Alarm message
Activation of protective device	Protective device in indoor unit is activated.	Thermal protector in indoor unit fan motor is activated.	<<P01>>
		Improper wiring connections of ceiling panel.	<<P09>>
		Float switch is activated.	<<P10>>
		O_2 sensor (detects low oxygen level) activated	P14
	Protective device in outdoor unit is activated.	Incorrect discharge temperature. (Comp. No. 1)	P03
		High pressure switch or over-load relay is activated. Power supply voltage is unusual. (The voltage is less than 160 V between L1 and L2 phase.)	P04
		Negative (defective) phase.	P05
		Compressor running failure resulting from missing phase in the compressor wiring, etc. (Start failure not caused by IPM or no gas.)	P16
		Incorrect discharge temperature. (Comp. No. 2)	P17
		Outdoor unit fan motor is unusual.	P22
		Overcurrent at time of compressor runs more than 80Hz (DCCT secondary current or ACCT primary current is detected at a time other than when IPM has tripped.)	P26
		IPM trip (IPM current or temperature)	H31
		Inverter for compressor is unusual. (DC compressor does not operate.)	P29
Thermistor fault	Indoor thermistor is either open or damaged.	Indoor coil temp. sensor (E1)	<<F01>>
		Indoor coil temp. sensor (E2)	<<F02>>
		Indoor coil temp. sensor (E3)	<<F03>>
		Indoor suction air (room) temp. sensor (TA)	<<F10>>
		Indoor discharge air temp. sensor (BL)	<<F11>>
	Outdoor thermistor is either open or damaged.	Comp. No. 1 discharge gas temp. sensor (DISCH1)	F04
		Comp. No. 2 discharge gas temp. sensor (DISCH2)	F05
		Outdoor No. 1 coil gas temp. sensor (EXG1)	F06
		Outdoor No. 1 coil liquid temp. sensor (EXL1)	F07
		Outdoor air temp. sensor (AIR TEMP)	F08
		Compressor intake port temperature sensor (SCT)	F12
		High pressure sensor.	F16
		Low-pressure sensor failure	F17
		Outdoor No. 2 coil gas temp. sensor (EXG2)	F23
		Outdoor No. 2 coil liquid temp. sensor (EXL2)	F24
EEPROM on indoor unit P.C.B. failure			F29
Protective device for compressor is activated	Protective device for compressor No. 1 is activated.	EEPROM on the main or sub outdoor unit PCB has failed.	F31
		Current is not detected when comp. No. 1 is ON.	H03
		Discharge gas temperature of the comp. No. 1 is not detected. Temp. sensor is not seated at the sensor holder.	H05
	Protective device for compressor No. 2 is activated.	Compressor No. 2 current trouble (overcurrent)	H11
		Compressor No. 2 current trouble (locked)	H12
		Compressor No. 2 CT sensor disconnected or short circuit	H13
		Compressor No. 2 discharge temp. sensor disconnected	H15
		Low pressure switch is activated.	H06
	Oil sensor fault. (Disconnection, etc.)	Comp. No. 1 oil sensor	H08
		Comp. No. 2 oil sensor	H27

Continued

7. Meaning of Alarm Messages

Alarm messages displayed on system controller			
Serial communication errors Mis-setting	Error in transmitting serial communication signal	Indoor or main outdoor unit is not operating correctly. Mis-wiring of control wiring between indoor unit, main outdoor unit and system controller.	C05
	Error in receiving serial communication signal	Indoor or main outdoor unit is not operating correctly. Mis-wiring of control wiring between indoor unit, main outdoor unit and system controller. CN1 is not connected properly.	C06
Activation of protective device	Protective device of sub indoor unit in group control is activated.	When using wireless remote controller or system controller, in order to check the alarm message in detail, connect wired remote controller to indoor unit temporarily.	P30

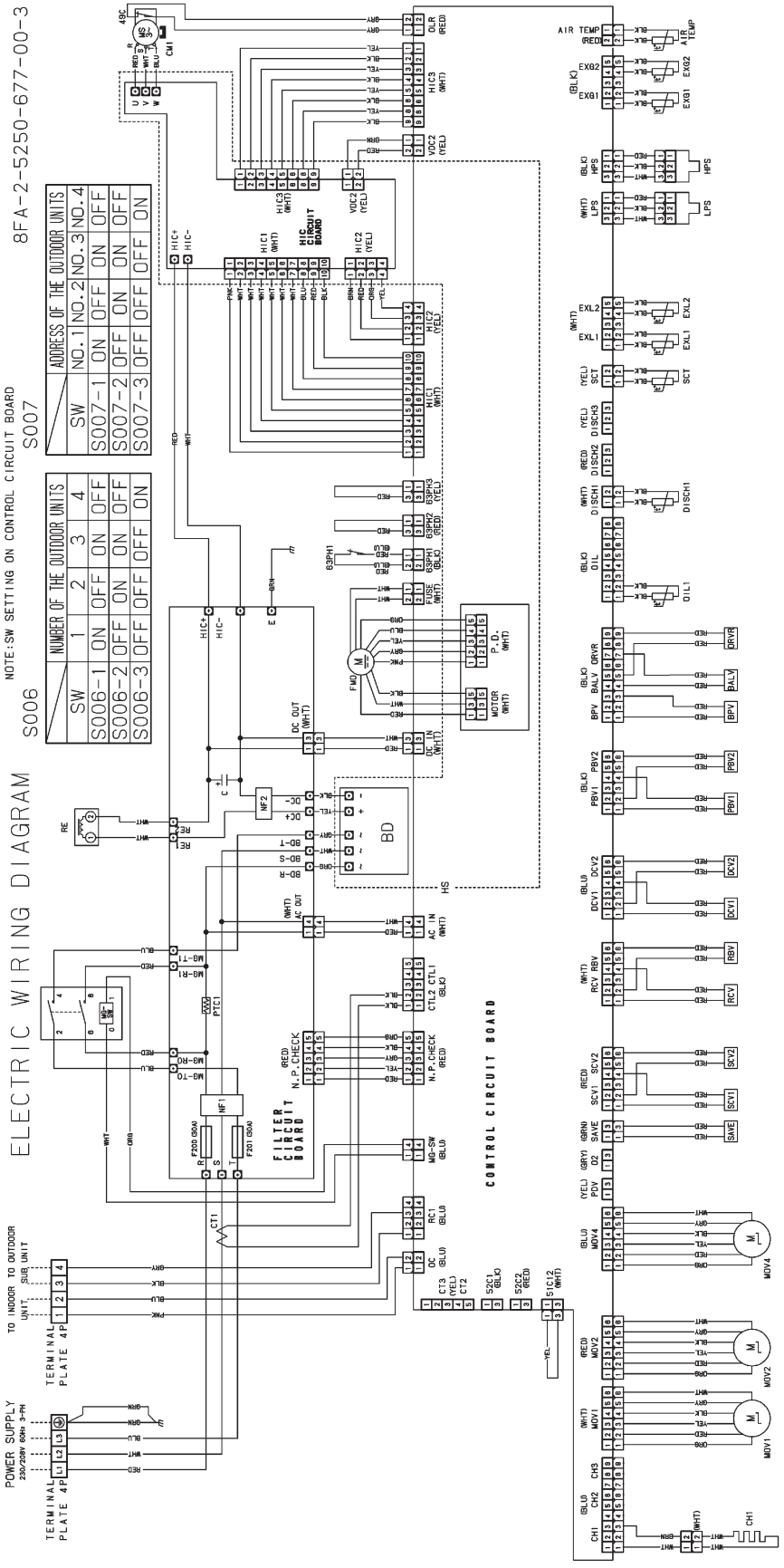
NOTE

1. Alarm messages in << >> do not affect other indoor unit operations.
2. Alarm messages in < > sometimes affect other indoor unit operations depending on the fault.

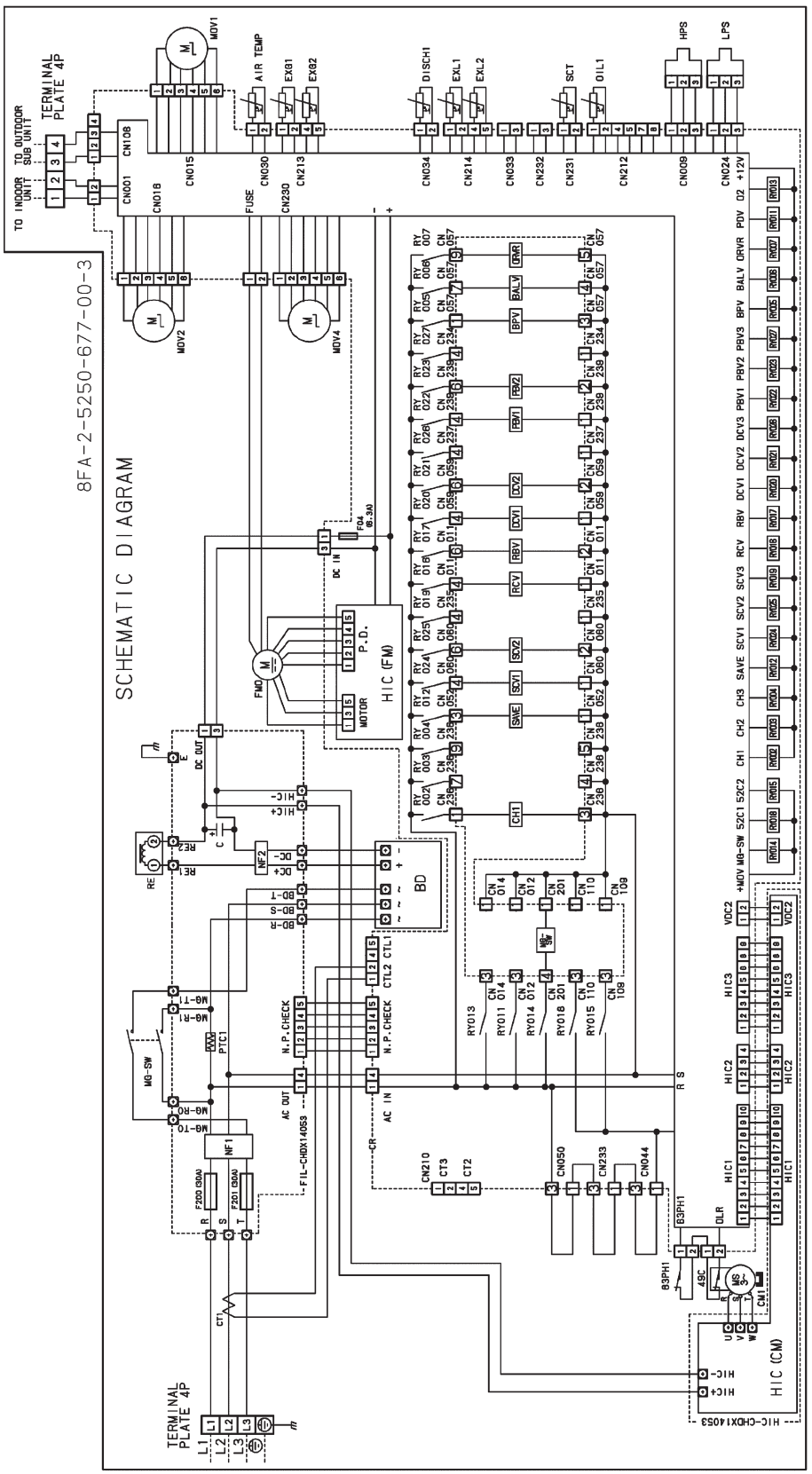
6. ELECTRICAL DATA

1. Outdoor Unit 6-2
(1) Electric Wiring Diagram U-72MF1U9, U-72MF1U9E 6-2
(2) Electric Wiring Diagram U-96MF1U9, U-96MF1U9E 6-4
2. Indoor Unit
* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

(1) Electric Wiring Diagram U-72MF1U9, U-72MF1U9E



Schematic Diagram U-72MF1U9, U-72MF1U9E



SYMBOLS	DESCRIPTION	SYMBOLS	DESCRIPTION	SYMBOLS	DESCRIPTION	SYMBOLS	DESCRIPTION
CM1	COMPRESSOR MOTOR	BALV	BALANCE VALVE	CH1	CRANK CASE HEATER	RY002~007, RY011~027	RELAY
FMO	OUTDOOR FAN MOTOR	DRVR	OIL RECOVERY VALVE	63PH1	HIGH PRESSURE SWITCH	CR	CONTROL CIRCUIT BOARD
SAVE	SAVE VALVE	49C	COMPRESSOR MOTOR THERMAL PROTECTOR	C	ELECTROLYTIC CAPACITOR	FIL-CHDX14053	FILTER CIRCUIT BOARD
SCV1, 2	SUCTION VALVE	MG-SW	POWER RELAY	RE	REACTOR	HIC-CHDX14053	HIC CIRCUIT BOARD
RCV, RBV	REFRIGERANT CONTROL VALVE	MOV1, 2, 4	MOTOR OPERATED VALVE	HIC	HYBRID IC		THERMISTOR
DCV1, 2	DISCHARGE VALVE	F4, 200, 201	OPERATION CIRCUIT FUSE	HS	HEAT SINK (RADIATOR)		CONNECTOR, TERMINAL BOARD
PBV1, 2	PRESSURE BALANCE VALVE	NF1, 2	NOISE FILTER (ON THE P.C.B)	PTC1	PTC THERMISTOR		TERMINAL
BPV	BYPASS VALVE	BD	BRIDGE DIODE	CT1	CURRENT TRANSFORMER		

WARNING

TURN OFF THE MAIN POWER SUPPLY SWITCH WHEN CHANGING P.C.B.. CONFIRM ALL THE L.E.D.S ON THE P.C.B. ARE OFF AND START TO REWORK. OTHERWISE YOU MAY BE KILLED BY AN ELECTRIC SHOCK.

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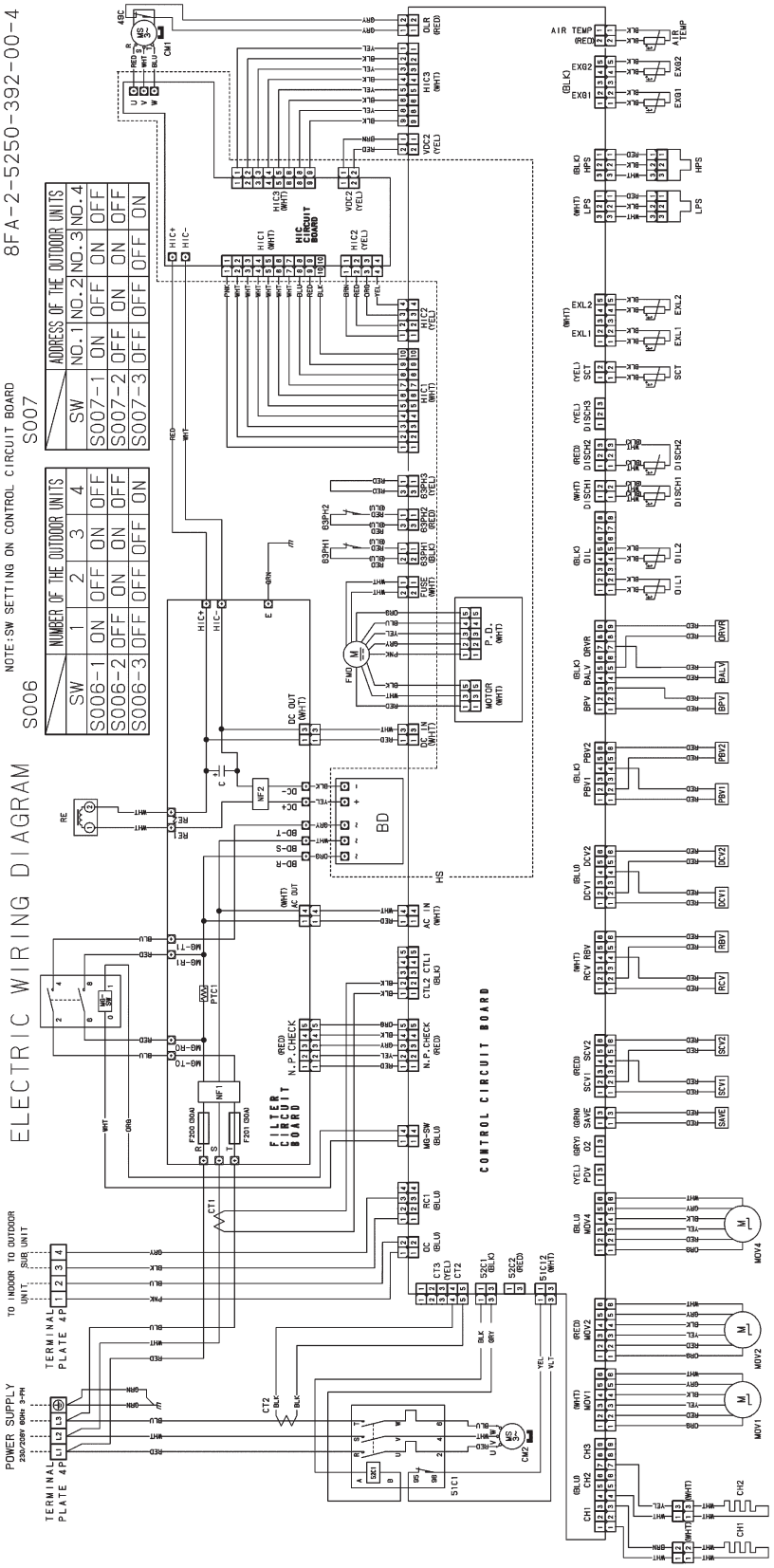
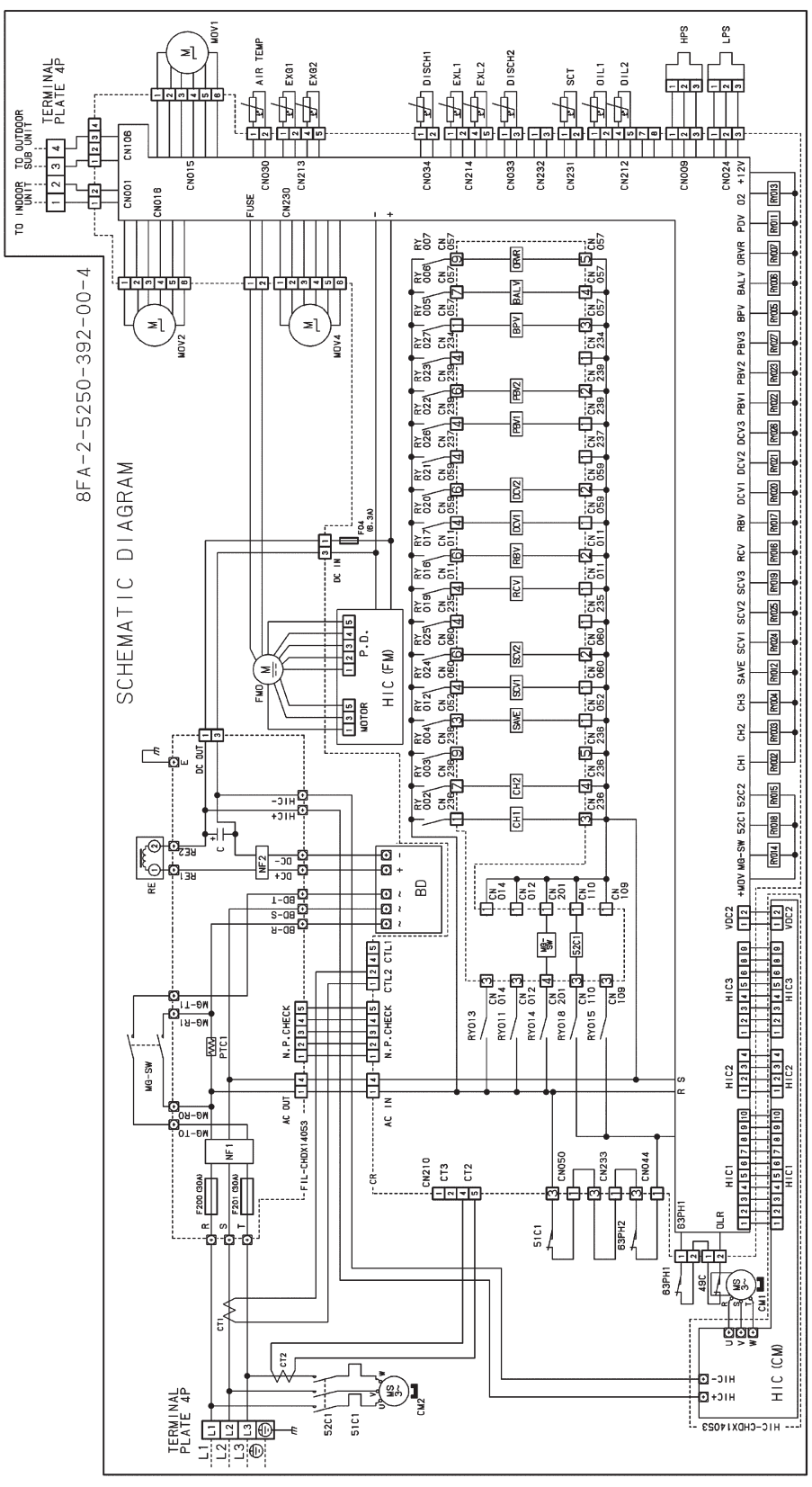
(2) Electric Wiring Diagram U-96MF1U9, U-96MF1U9E



Schematic Diagram U-96MF1U9, U-96MF1U9E



SYMBOLS	DESCRIPTION
CM1, 2	COMPRESSOR MOTOR
FMO	OUTDOOR FAN MOTOR
SAVE	SAVE VALVE
SCV1, 2	SUCTION VALVE
RCV, RBV	REFRIGERANT CONTROL VALVE
DCV1, 2	DISCHARGE VALVE
PBV1, 2	PRESSURE BALANCE VALVE
BPV	BYPASS VALVE
BALV	BALANCE VALVE

SYMBOLS	DESCRIPTION
ORVR	OIL RECOVERY VALVE
49C	COMPRESSOR MOTOR THERMAL PROTECTOR
51C1	COMPRESSOR MOTOR OVERCURRENT RELAY
MG-SW	POWER RELAY
52C1	COMPRESSOR MOTOR MAGNETIC CONTACTOR
MOV1, 2, 4	MOTOR OPERATED VALVE
F4, 200, 201	OPERATION CIRCUIT FUSE
NF1, 2	NOISE FILTER (ON THE P.C.B)

SYMBOLS	DESCRIPTION
BD	BRIDGE DIODE
CH1, 2	CRANK CASE HEATER
63PH1, 2	HIGH PRESSURE SWITCH
C	ELECTROLYTIC CAPACITOR
RE	REACTOR
HIC	HYBRID IC
HS	HEAT SINK (RADIATOR)
PTC1	PTC THERMISTOR

SYMBOLS	DESCRIPTION
CT1, 2	CURRENT TRANSFORMER
RY002~007, RY011~027	RELAY
CR	CONTROL CIRCUIT BOARD
FIL-CHDX140S3	FILTER CIRCUIT BOARD
HIC-CHDX140S3	HIC CIRCUIT BOARD
	THERMISTOR
	CONNECTOR, TERMINAL BOARD
	TERMINAL

WARNING TURN OFF THE MAIN POWER SUPPLY SWITCH WHEN CHANGING P.C.B.. CONFIRM ALL THE L.E.D.S ON THE P.C.B. ARE OFF AND START TO REWORK. OTHERWISE YOU MAY BE KILLED BY AN ELECTRIC SHOCK.

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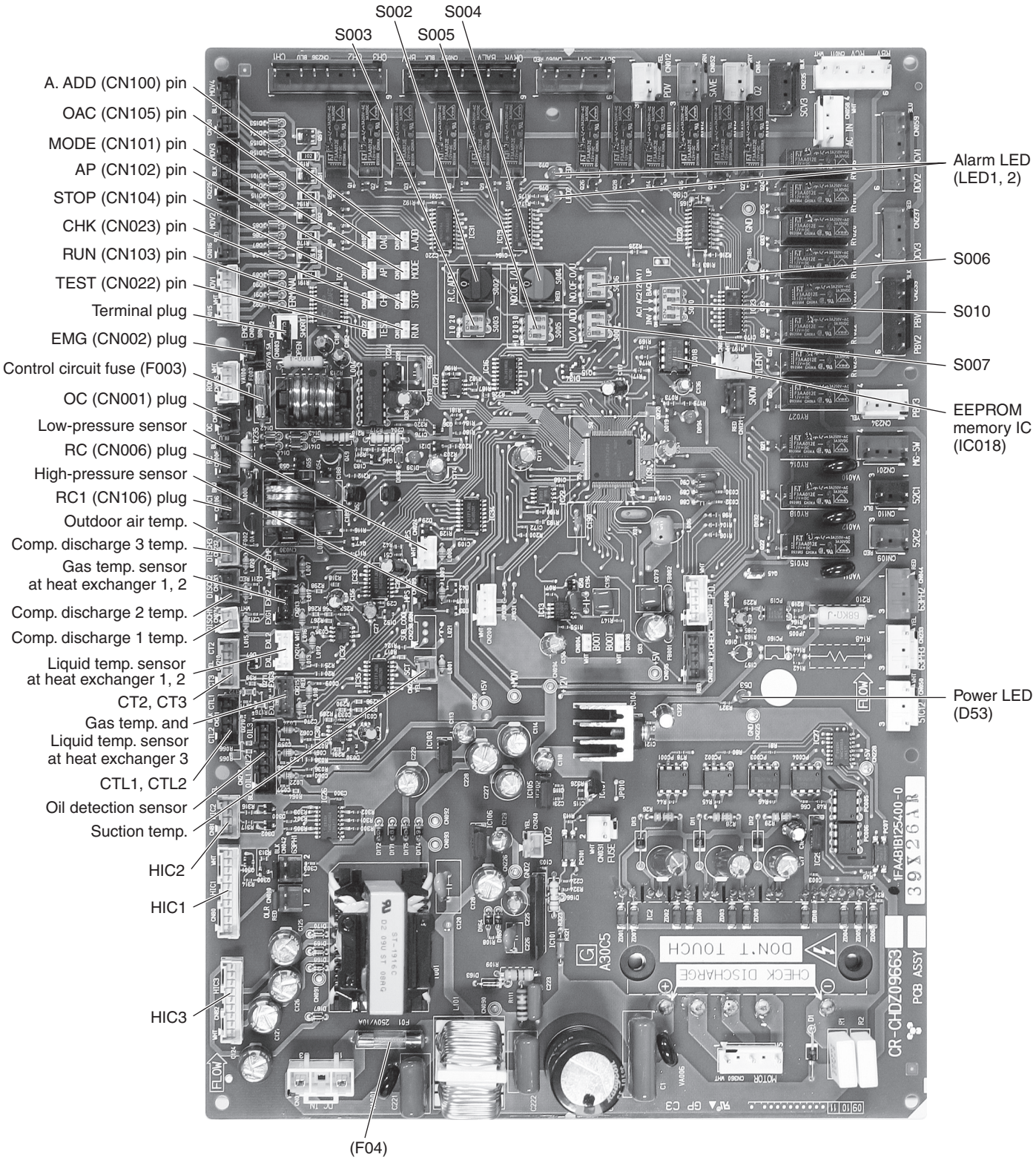
* Refer to the 2WAY VRF SYSTEM TECHNICAL DATA (TD831157)

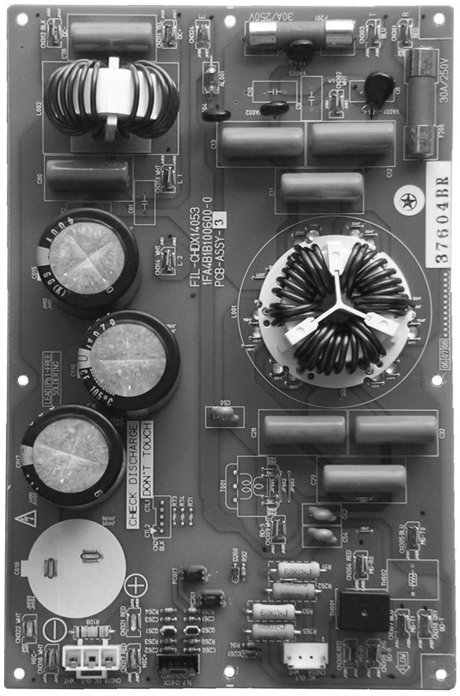
1. Outdoor Unit Control PCB

1-1. Outdoor Unit Control PCB CR-CHDZ09663

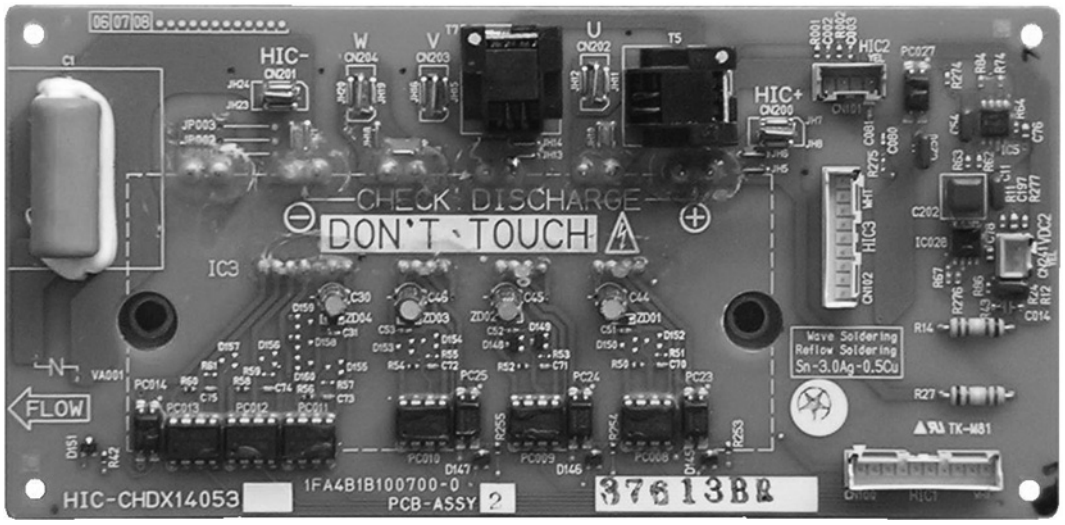


1. Outdoor Unit Control PCB

1-2. Outdoor Unit Filter PCB FIL-CHDX14053



1-3. Outdoor Unit HIC Board HIC-CHDX14053



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1. Outdoor Unit Control PCB

1-4. Functions (for CR-CHDZ09663)

Automatic address setting (CN100)	2P plug (white): Automatic address setting pin • Short-circuit this pin for 1 second or longer to automatically set the addresses at the indoor units that are connected to that outdoor unit and are within the same system. • The system address is "1" at the time of shipment. Automatic address setting is necessary even for communications lines in a single system where the inter-unit control wiring does not cross to any other systems. • While automatic address setting is in progress, the 2 LEDs (LED1, 2: red) on the outdoor unit control PCB blink alternately. (Short-circuiting this pin while automatic address setting is in progress will stop the automatic address setting operation.)
S002	Rotary switch (10 positions, black): Outdoor system address setting switch • The setting is "1" at the time of shipment. It is not necessary to change the setting if wiring is connected only to an outdoor unit and indoor units in a single system and the inter-unit control wiring does not cross multiple systems. • If wiring links the inter-unit control wiring for multiple systems to the same communications lines, then a different address must be set for each refrigerant tubing system. • If wiring links multiple systems, a maximum of 30 systems (up to 64 indoor units) can be connected. This setting can be set up to "39," however control will be for 30 systems even if the setting is set to higher than 30. An alarm will be displayed if system addresses are duplicated. (For details, refer to Table 7-1.)
S003	DIP switch (2P, blue): Switches for setting system address 10s digit and 20s digit • If 10 systems or more are set, the setting is made by a combination of this DIP switch and S002. • If 10 - 19 systems are set, set switch 1 (10s digit) to ON. • If 20 - 29 systems are set, set switch 2 (20s digit) to ON, and set switch 1 (10s digit) to OFF. • If 30 systems are set, set both switch 1 (10s digit) and switch 2 (20s digit) to ON. (For details concerning S002 and S003, refer to Table 7-1.)
S004	Rotary switch (10 positions, red): Switch for setting the number of connected indoor units. In order to allow the outdoor unit to manage indoor units in the same refrigerant system, set the number of connected indoor units. (For details, refer to Table 7-2.)
S005	DIP switch (3P, blue): Switches for setting the 10s, 20s, and 30s digit for the number of connected indoor units • If 10 systems or more are set, the setting is made by a combination of this DIP switch and S004. • If 10 - 19 systems are set, set only switch 1 (10s digit) to ON. • If 20 - 29 systems are set, set switch 2 (20s digit) to ON, and set switch 1 (10s digit) to OFF. • If 30 - 39 systems are set, set only switch 3 (30s digit) to ON. (For details concerning S004 and S005, refer to Table 7-2.)
S006	DIP switch (3P, blue): Switch for setting the number of outdoor units • Turn the switches ON according to the number of outdoor units (1 - 4). (For details, refer to Table 7-3.)
S007	DIP switch (3P, blue): Unit No. setting switch • The setting is "1" at the time of shipment. (For details, refer to Table 7-4.)
S010	DIP switch (3P, blue): Backup operation switch If an INV compressor has malfunctioned, turn CT1 ON and Back Up SW ON to operate the outdoor unit using only the constant-speed compressor. If a constant-speed compressor has malfunctioned, turn CT2 ON and Back Up SW ON to operate the outdoor unit using only the INV compressor. (Disconnect the wiring from the constant-speed compressor.)

1. Outdoor Unit Control PCB

Terminal plug	3P plug (black): For communications circuit impedance matching • A connecting socket (3P, black) is attached to the terminal plug at the time of shipment from the factory. • In the case of link wiring which combines the inter-unit control wiring for multiple systems into a single communications circuit, leave the connecting socket in place at only one of the outdoor units, and move the socket from the "SHORT" side to the "OPEN" side at all other outdoor units. If multiple connecting sockets are left in place, communications trouble will occur.
LED1, 2 D72, D75	LED (red × 2) • LED 1 and 2 blink alternately while automatic address setting is in progress. • Display the alarm contents for alarms which were detected by the outdoor unit.
Power LED D53	LED (red): Power indicator Indicates the DC 5V power on the outdoor unit control PCB.
Run (CN103)	2P plug (white): Start pin Short-circuit this pin and apply a pulse signal to start all indoor units in that refrigerant system.
Stop (CN104)	2P plug (white): Stopt pin Short-circuit this pin and apply a pulse signal to stop all indoor units in that refrigerant system.
AP (CN102)	2P plug (white): Vacuuming pin • To perform vacuuming of the outdoor unit, short-circuit this pin and then turn the power ON. All solenoid valves turn ON and vacuuming begins smoothly. (Do not perform automatic address setting at this time.) • Release the short-circuit to return the unit to normal status.
Mode (CN101)	2P plug (white): Indoor unit Heating/Cooling mode change pin • When operating the compressors to perform automatic address setting, operation in Heating mode can be normally used. However, short-circuiting this pin performs operation in Cooling mode. (Static signal) • Short-circuiting this pin during ordinary operation changes the mode from Cooling to Heating (if the current mode is Cooling) or from Heating to Cooling (if the current mode is Heating).
Test (CN022)	2P plug (white) • This pin is used to test the PCB at the factory. • When the power is turned ON after this pin has been short-circuited, all output signals will be output in sequence. (Sequential output does not occur if this pin is short-circuited when the power is already ON.) Releasing this pin returns the unit to normal control.

1. Outdoor Unit Control PCB

Table 7-1. Setting the System Address [S002: Rotary switch (black), S003: 2P DIP (blue)]

	Outdoor system address	S002 setting	S003 setting	
			1P (10s digit)	2P (20s digit)
1 refrigerant system only	1	0	OFF	OFF
Link wiring	1	1	OFF	OFF
	2	2	OFF	OFF
	3	3	OFF	OFF
	4	4	OFF	OFF
	5	5	OFF	OFF
	6	6	OFF	OFF
	7	7	OFF	OFF
	8	8	OFF	OFF
	9	9	OFF	OFF
	10	0	ON	OFF
	11	1	ON	OFF
	12	2	ON	OFF
	13	3	ON	OFF
	14	4	ON	OFF
	15	5	ON	OFF
	16	6	ON	OFF
	17	7	ON	OFF
	18	8	ON	OFF
	19	9	ON	OFF
	20	0	OFF	ON
	21	1	OFF	ON
	22	2	OFF	ON
	23	3	OFF	ON
	24	4	OFF	ON
	25	5	OFF	ON
	26	6	OFF	ON
	27	7	OFF	ON
	28	8	OFF	ON
	29	9	OFF	ON
	30	0	ON	ON

Table 7-2. Setting the Number of Indoor Units [S004: Rotary switch (red), S005: 2P DIP (blue)]

Number of Indoor Units	S004 Setting	S005 Setting		
		1	2	3
1	1	OFF	OFF	OFF
2	2	OFF	OFF	OFF
3	3	OFF	OFF	OFF
9	9	OFF	OFF	OFF
10	0	ON	OFF	OFF
11	1	ON	OFF	OFF
19	9	ON	OFF	OFF
20	0	OFF	ON	OFF
21	1	OFF	ON	OFF
29	9	OFF	ON	OFF
30	0	OFF	OFF	ON
31	1	OFF	OFF	ON
39	9	OFF	OFF	ON
40	0	ON	ON	ON

Table 7-3. Setting the Number of Outdoor Units [S006: DIP switch (blue)]

Number of Indoor Units	S006 Setting		
	1	2	3
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON

Table 7-4. Setting the Outdoor Unit address

Outdoor Unit Address	S007 Setting		
	1	2	3
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON

TENTATIVE